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23 JANUARY 1989

JPRS Report

Science & Technology

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Minister Describes Policy, Creates New Monitor Group

36980072a Paris LE MONDE in French
18 Nov 88 p 12

[Article: "Mr Curien's Communication to the Ministers Council: The Government Wants to Develop Research and Information on Advanced Materials"]

[Text] The advanced materials of today and tomorrow figured prominently on the agenda of the ministers council of Wednesday 16 November. On this occasion, the minister of research and technology, Mr Hubert Curien, after consultation with his colleague, the minister of industry, defined the orientations of his research policy in this eminently strategic sector, a sector to which France devotes a total of about Fr4 billion per year (in both public and private funds). According to Mr Curien, the problem is not so much to ensure the development of advanced materials in laboratories as to promote the dissemination of the results achieved among manufacturers.

Therefore, in order to mobilize all those working in this sector (researchers, engineers and manufacturers), and in particular small and medium-sized businesses—whose involvement in these technologies is inadequate—the minister proposed to take three steps:

— *To increase research in certain strategic technologies.* High-temperature superconductivity is one of them. Special efforts (improved theoretical understanding of the phenomena involved and applications-oriented experiments) should be devoted to it, as it could bring about major changes in electronics and electrical engineering.
— *To improve the dissemination of the knowledge acquired,* in the context of the large technological programs (e.g. the nuclear and space programs) which have led to the development of new materials such as carbon-carbon and ceramics and to the modification of existing materials. This will be the task of orientation committees, to be created at program management level, in some cases in agreement with the military.
— *To make sure that government efforts are more consistent.* An interministerial "Innovation, Dissemination, Materials" group should be created soon. It will assess periodically the status of research and the dissemination of the results achieved, and it will submit an annual report on the progress made and on potential applications and recommended priorities.

Du Pont De Nemours Develops New Liquid Crystal Polymers

36980078a Paris AFP SCIENCES in French
27 Oct 88 p 43

[Text] Paris—Du Pont de Nemours has announced the development of a new family of polymers combining mechanical, thermal, and chemical qualities with a degree of ease in application.

Intended for the aviation and aerospace, automobile and biomedical market, these products provide thermoplastic characteristics of rigidity, which makes them suitable in certain fields for replacing the present metals, ceramics and composites for light and complex parts.

This family of liquid crystal polymers currently includes three amorphous polymers and two crystalline polymers, and mixtures and alloys with elastomers and thermoplastic resins are being developed.

FRG Composite Friction Welding Method Discussed

36980062b Stuttgart VDI NACHRICHTEN in German
7 Oct 88 p 33

[Article: "Ceramics and Metal Join Tightly; Friction Welding Aids Machine Production"]

[Text] Bremen, 7 Oct 88 (VDI-N)—Extensive industrial applications will not be possible for promising ceramic materials without suitable processes by which to join ceramic and metallic elements. The bonding must be sufficiently strong and temperature-resistent. Current methods are of only limited use for industrial production.

Researchers working on a project carried out by the Fraunhofer Institute for Applied Materials Research in Bremen in cooperation with the Kuka firm of Augsburg and supported by the Research and Technology Ministry have been able to produce ceramic/metal bonding using the friction welding technique that meet quality standards for industrial production. This technique involves rotating one of the machine parts to be joined while the other is held in place and pressed against the rotating part.

The friction produces a local heating in both join surfaces. The weld is produced in the subsequent, precisely determined braking and compression phase. Tension tests of a join between aluminum and aluminum oxide measured strengths of almost 200 N/mm^2. Also noteworthy is the short 10 second bonding time, which makes this technique suitable for serial production.

AEROSPACE, CIVIL AVIATION

EUROMART Issues Report on Aeronautics Industry

3698A035 Brussels EC PRESS RELEASE in English
No IP(88) 646, 3 Nov 88 pp 1-2

[Report: "Europe's Future in Aeronautics"]

[Text] The European aeronautics industry has substantial cause for concern about its future, despite the major achievements of recent years. Its competitiveness in world markets is threatened by the powerful technological drive now underway in the United States, expressing the Administration's determination to reassert US leadership in

world aeronautics; and by the aeronautics [industries themselves]; and by the emergence of government-backed aeronautical industries in newly industrialised countries.

This is the main finding of the EUROMART[1] report prepared for the Commission by the Community's major aeronautical companies, which is being made public today. It concludes that a vigorous programme of cooperative research and technological development is essential at Community level if the industry is to continue to thrive.

This report shows that Europe's aeronautical industry has made a major contribution to Europe's industrial base, in terms of employment provided, the wide range of high technologies it deploys, and its large and increasing volume of exports. Advanced technology played a major role in gaining this position and will be vital to maintain it. In particular, enhancing aircraft safety, saving energy, and reducing adverse effects on the environment will be major objectives, along with a reduction in operational aircraft delays brought about by an increase in ease of operation.

The study released today shows that the aeronautical industry, world-wide, has a large and expanding market, and the market will continue to expand. In the civil sector, world passenger traffic doubled in the last ten years and is expected to double again in the next.

The European aeronautical industries have produced technically proficient products incorporating advanced technologies which have achieved a strong penetration (25 percent) of the highly competitive civil world market. But for precisely these reasons, other competitors are making a major push to increase their market share. In the United States, the aeronautical industry receives massive support from government agencies. Japan has an increasing level of activity in its aeronautical industry, which with strong government encouragement and financial support has proved skillful and quick to learn. The newly industrialised countries such as Brazil, Indonesia, and China are now actively attacking marketing sectors.

In response to this study, the Commission has already proposed a two-year pilot programme of Community action in the field of aeronautical research and technology acquisition, based on the use of existing financial resources. This will enable research to be undertaken in a number of technological fields which are of immediate importance to the European aeronautical industry. It will be an self-contained programme, but will also help define the longer-term actions to be taken.

The need for cooperation between European aeronautical companies in the development and production of major aircraft has been recognised for many years, and the practice is now firmly established in the industry. Notable illustrations of this are provided not only by large transport aircraft but also by computer aircraft and helicopters. There has also been increasing cooperation in research and technology on national basis. But the urgent requirement now is to raise this cooperation to Community level.

The Commission now aims to stimulate the European aeronautics industry to extend this cooperation to research and technology acquisition, and to strengthen the technology base on a broad front by bringing about more effective collaboration in precompetitive research. This process will also be reinforced by the participation of specialist companies in all member states that are suppliers to the aeronautical industry in a variety of technical fields, as well as research establishment and universities.

The European aeronautical industry needs to be able to maintain a command of the state-of-the-art technology and anticipate new developments if it is to maintain or improve its share of world markets. This must be focussed on goals determined by a cooperative process based upon an analysis of future industrial needs.

The aeronautical industry is vital to Europe. It employs about 200,000 people in the Community, with a turnover of ECU 16 billion; and it is clearly unacceptable to make the cost of remaining competitive acceptable by increasing the level of cooperation. This is the objective of the current Commission initiative.

Footnote:

1. EUROMART: European Cooperative Measures for Aeronautical Research and Technology. The report was prepared by Aeritalia, Aerospatiale, Avions Marcel Dassault-Breguet Aviation, British Aerospace, CASA [Aeronautic Constructions Limited Company], Dornier, Fokker, Messerschmitt-Boelkow Blohm, and SABCA [Belgian Aeronautic Constructions Limited Company].

SEP Test Bench for 'Vulcain' Engine Described

3698A025 Paris BULLETIN DU GIFAS in English 20 Oct 88 pp 2-6

[Text] SEP's [European Propulsion Company] "HM60 Vulcain" is a motor operating on liquid hydrogen and oxygen. It is a booster for rockets and delivers a thrust of 800 kN at sea level and 1000 kN in vacuum. It will be used with the powder-powered "Ariane 5" space launcher and will constitute the sole motor of the central "H120" body. Studies on the motor started in the SEP works seven years ago.

The PF52 test bench was built under a contract from Centre National d'Etudes Spatiales (CNES) on behalf of the European Space Agency (ESA) by Societe Europeenne de Propulsion (SEP) acting as prime contractor and coordinating the many European manufacturers involved.

Final design was frozen in February 1985 and work started in July 1985. Civil work and delivery of mechanical and fluid equipment were completed by December 1987. After circuits had been integrated and the electric systems installed, partial acceptance authorizing an initial test phase on the hydrogen turbo pump was officially pronounced in April 1988. Final acceptance operations proceed while alternating with the first testing of the turbo pumps.

High-Pressure and Very-High-Pressure Cryotechnical Systems

The high-pressure cryotechnical system used during the second test phase is intended for supplying the gas generator from liquid hydrogen and liquid oxygen tanks at 400 bars and also for supplying the regulation valves.

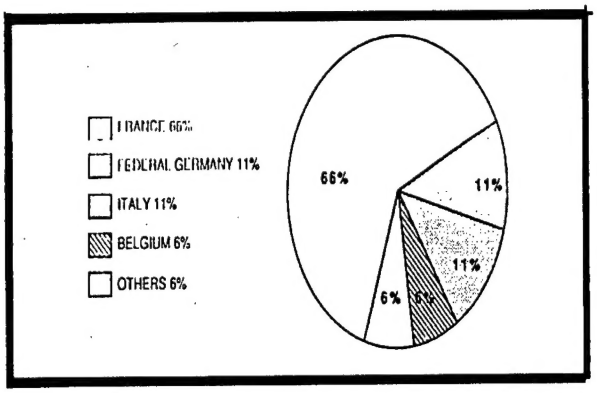
The unit itself is associated with gaseous nitrogen and hydrogen sources under 800 bars high pressure, for pressurization of the former.

The hydrogen under very high pressure is also used for driving turbines during the first test phase. This is possible because at ambient temperature, this gas has thermodynamic properties similar to those of the hot gas normally produced by the generator. Aerodynamic conditions within the turbines can thus be sufficiently simulated, while supply pressures are comparable to those encountered during normal operation.

The gases that have passed through the turbines, except when pure hydrogen, come from the generator and still contain 85 percent of same in molecular composition (this composition limits gas temperature in order to protect the turbines). Consequently, they must always be routed to a specific torch for burning.

Work Allotment

Prime contractorship, basic studies, process engineering	SEP
Development engineering and follow-up	SERETE
Civil engineering, frame and miscellaneous work	LEON GROSSE/ EGECO
Low-voltage electricity	AMICA
Low-pressure cryogenics—Supplies	Air Liquide
High-pressure cryogenics—Prime contractorship	MBB
High-pressure cryogenics—Supplies	MGI, UHDE, SNCMP
Conventional fluids and complete integration	Air Liquide/SIGED
Hydrogen compressors—Supplies	HOFER
Data processing system and real-time peripherals	ETCA/Matra
Electric integration and cabling	AMICA
Integration of test specimen, bench acceptance and miscellaneous adaptations	SEP



Countries Allotment

Thomson-CSF, Dassault To Cooperate on Rafale Radar

36980072c Paris LE MONDE in French 3 Dec 88 p 9

[Article by special correspondent Jacques Isnard: "After Flying on Board a Mirage-2000, Mr Rocard Announced that Thomson-CSF and Serge Dassault Electronics Would Cooperate on the Rafale Radar"]

[Text] Mont-de-Marsan—Was it self-criticism, a mea culpa or self examination? The prime minister, Mr Michel Rocard, hardly waited until he had left the Mirage-2000 on which he had just completed a 45-minute flight to give his impressions: "That was a superb flight. It is very impressive and very complex. It is a good thing that I realized how complex it is, now that we are debating the next fighter aircraft. That will enable me to be a little less illiterate." On Thursday 1 November, at the Mont-de-Marsan (Landes) air base, Mr Rocard thus made his peace with the Air Force which, at the time, had not appreciated the prime minister's remarks on the state of "advanced disaster" of the Rafale project, the new fighter aircraft designed to equip the French Air Force starting in 1996.

Dressed in a flight suit, with Col Serge Cocault, head of the test facilities group, for his pilot, Mr Rocard, acting as "an identified flying object" (to quote his own words), took part in an interception mission above Mont-de-Marsan on board a two-seat training Mirage-200. For the occasion, the Air Force had outdone itself: flight at an altitude of 13,000 m, at Mach 1.2 (about 1,500 km/h); attempt at intercepting another Mirage-200 piloted by the prime minister's principal military aid himself, Gen Bernard Norlain; simulated refueling with a C-135 tanker aircraft; simulated gun and air-to-air missile firing; and, finally, a 10-minute low-altitude flight (900 km/h at an altitude of 150 m). Mr Rocard got Colonel Cocault's verdict: "The prime minister is a good pilot."

Planned Creation of an Economic Interest Group

Talking to the press, the prime minister went back on his previous statements against the Rafale. "The fact that the project was a disaster as far as negotiations for

foreign participations were concerned, he explained, "does in no way alter the fact that France will get the future fighter aircraft it needs. I have every intention to help. The project is progressing according to schedule. The resolve of the French Republic, its president and its prime minister is total. The development costs of the Rafale are progressing overall as expected, i.e. tightly. I regret that a larger international cooperation did not prove feasible."

Answering a question on the prospect for cooperation between Thomson-CSF and Serge Dassault Electronics (ESD) to develop the Rafale radar, Mr Rocard indicated: "We have not quite completed the process yet, but already the competition has proved exceptionally favorable. The spirit of competition of the two companies and their eagerness to do the job have motivated them to put their energy into it. It now seems possible to arrive at a solution that would combine the most significant advantages and technical innovations of the two companies. I am confident that they will soon submit a cooperation proposal based on the government guidelines, which are that they should cooperate in every way."

The prime minister declined to say more. However, the manufacturers who were there mentioned a project to create an economic interest group within which Thomson-CSF would be recognized as "leader" of the radar project and would get two thirds of the responsibilities (in particular the antenna and the air-to-air functions); ESD would get the remaining third (air-to-ground functions and countermeasures). An economic interest group would also have the advantage that it could include foreign partners, the British Ferranti for instance, in the hope of developing equipment that could be used by both the Rafale and its European rival.

Mr Rocard's visit to Mont-de-Marsan occurred precisely at a time when the Air Force is expressing some concern as to the inadequacy of its personnel. The chief of staff, Gen Achille Lerche, who accompanied the prime minister, did not conceal it, about 12 days ago, when he met the senators of the commission on foreign affairs and defense. He told them, in substance, that he was "concerned" by the deflation of personnel decided at a time when the responsibilities and missions of the Air Force required the creation of 3,114 jobs by 1992. General Lerche then informed the senators that he was considering dismantling some units and closing one air base, "so as not to increase the constraints placed on the personnel beyond what is bearable."

When asked about this possibility, Mr Rocard answered: "What public opinion as a whole expects from the government of the Republic is precisely serious reasons to believe that it gets the best possible defense at the least possible cost. The 1989 budget puts a ceiling on our overall expenditures. It is the responsibility of the minister of defense, advised by the Air Force general staff, to provide the best possible adaptation of the facilities to the forces. If a base has to be closed, then probably that base was not absolutely necessary. In the civil sector, in the state-owned industrial sector and in the military sector, facilities must everywhere be optimized to fit resources."

Fokker Considers U.S. Production Line, Looks for Investors

3698006 1a Rotterdam NRC HANDELSBLAD in Dutch 11 Nov 88 p 11

[Article by Paul Frentrop: "Fokker Gets a Little Bigger"]

[Text] London, 12 Nov—Fokker is getting a little bigger. Whereas the national aircraft manufacturer used to sell its F27s and F28s singly or in pairs, the F50 and in particular the F100 involve orders of dozens or even hundreds of airplanes. This requires different organization.

Since Fokker's production lines are filled for the next 3 to 4 years by orders already received, another big order of, say, 200 airplanes would mean that another production line would have to be built. Land has already been bought near Schiphol Airport for this, but Fokker is clearly holding open the option of starting up a new factory in the United States.

This would cost 250 million guilders and required 400 qualified workers in the United States, according to calculations by Fokker's man for finance, E.J. Nederkoorn.

According to him, a factory in the United States would have various advantages. The most important is that because of the larger scale of potential orders, greater fluctuation in production can occur. In the social climate in the Netherlands, it is not possible to quickly adjust fixed costs. Fokker does not want to first hire extra people and then fire them, as has been done in the past. In the United States, these types of adjustments are much easier, and there is surplus capacity from other aircraft manufacturers, such as Lockheed. Another advantage is that the dollar risk is less. Although Fokker gets almost all of its income in dollars, this is true of only 40 percent of costs.

Fokker used to produce one F27 and one F28 a month. Before long, Fokker will be making three F50s and three F110s each month. If more are needed, then it will be time for production in the United States.

Fokker management is currently engaged in a road show to sell off 16 million newly issued stock shares. If investors do not buy them, then the government will convert an outstanding loan to Fokker into shares, meaning that Fokker will get less new capital. Banks guarantee that they will sell seven million of the shares at 20 guilders a piece, so that Fokker already has 140 million. Fokker hopes to get rid of another seven million

to parties other than the state. If so, Fokker will then have 280 million in equity capital, and the government will then convert the rest of its loan into 6.6 million in extra issued shares.

The Fokker team was in London yesterday. Before that, the company was in Geneva and Zurich. Edinburgh, Glasgow, Paris and Amsterdam (Tuesday) are yet to come. In the words of the acting chief, Dr R.J. Van Duinen, Fokker is for the time being busy "selling stock instead of airplanes."

Foreigners are more willing to invest in Fokker than Dutch investors, at least that is what Fokker thinks. For Dutch investors, Fokker, which is so often the subject of raw publicity, is too peculiar. Foreign institutes can look more calmly at the longer term of 10 to 15 years, in which new airplanes must yield profits. For them, Fokker is one of only five remaining manufacturers of passenger jets in the world, which gives its stock a sense of exclusiveness. Already, an estimated 70 percent of Fokker stock is in foreign hands.

Growth Market

The analysts that Fokker's bank, J. Henry Schroder Wagg & Co, had invited yesterday to the resplendent Painters Hall in London were told that the F50 and F100 would each take over 30 percent of the world market for 50- and 100-seaters, respectively. According to Fokker, the size of that market can be estimated rather easily. By the year 2003, it will be 2,834 airplanes, of which 378 will be F50s and 472 F100s. The market will be helped by developments in the United States and in Europe. In the United States, sales will profit from the growth of the hub and spoke system developed by the airlines, which use a major airport as a point of departure and from there serve smaller airports with smaller aircraft. In Europe, the network of connections by the major airlines is still growing. And smaller airplanes are most efficient for short distances. Thus, in Fokker's opinion, smaller airplanes constitute a growth market. In the short term, moreover, there will be heavy demand for modern craft on this market. Airplanes last for around 20 years, and right now a relatively large percentage of aircraft in service are approaching that age. This demand for modernization is one of the reasons that Fokker is seriously thinking about an extra production line.

Earnings

The question remains of whether Fokker will be able to not only sell airplanes, but also make money on them. This will at any rate not be the case through 1989, even though Fokker is considering paying a dividend next year. Profits during that year will not come from the F50 and F100, but rather from other programs, such as military work. It is not until 1990 that the new airplanes will turn a profit, even though the F50 is yielding a positive cash flow even now and the F100 will reach that point next year. Together with the returns from the new stock issue, which will be used to clear up bank credits, this means a considerable reduction in interest payments, which swelled to 44 million the first half of this year.

Stockholders

In addition, Fokker has resolved to lower annual production costs by 200 million guilders. The manufacture of aircraft is subject to a steep curve: The first airplane is difficult, but as more are built, fewer man-hours are needed per aircraft.

Investors also hope that Fokker will see some profits on the rate of exchange, assuming that the dollar has now reached its low point.

Whether the stockholders will share in improved earnings is another question, even though Fokker envisages a high pay-out ratio. Even if the F50 and F100 programs, which were begun in 1983, go well until the year 2000, Fokker will still have to once again begin developing a new model in about 5 years.

Thus far, the billions of guilders needed for this have been financed by the Dutch government. About one billion of Fokker's capital consists of government money that must be repaid from the returns from airplanes sold. Thus, the state is subordinate to the stockholders, according to the Fokker management at yesterday's presentation to British investors.

After the dark months at the end of last year, when Fokker's survival was on the line because startup losses appeared too great for the company, the state has let it be known that Fokker must find a connection with a strong partner by the end of 1991. The state thinks that the risks are becoming too great.

To this end, Fokker has issued a "obligation of intent." But to listen to the Fokker management, it seems that they are stuck on self- sufficiency. "Now things are going well again, and we have time to calmly looking into cooperation." But in the eyes of Fokker's CEO, this should be cooperation on a project basis at most. Just as Short of Northern Ireland and MBB of Germany bore the risks for providing, respectively, the wings and fuel tanks for the F28, cooperation is under way with major suppliers for the F50. "We were the first in Europe to enter into that sort of cooperative venture. That must remain an option for the future as well, on a program-by-program basis," said Van Duinen yesterday in London.

Norway To Study Hermes Space Environment for ESA

36980059a Oslo AFTENPOSTEN in Norwegian 4 Nov 88 p 24

[Article by Rolf L. Larsen: "Norwegian 'Living Environment' in New Space Craft"]

[Text] Trondheim—Norwegian researchers with offshore experience will help create working and living conditions for European astronauts. The researchers will

determine the requirements that must be met by astronauts' living environment and study the stresses to which the astronauts will be subjected during long stays in space. There are many similarities between conditions on the ocean floor and those in space. The project involves space flights in the European shuttle Hermes and in a "workshop" where the space station will be built.

"We have two contracts with the European space organization ESA [European Space Agency] to study a number of aspects related to working and living under extreme conditions in space. Knowledge gained by Norwegian researchers who have studied the working environment of divers on the ocean floor will now be of benefit to European space research," said section chief Arvid Paasche at the medical technology section of SINTEF [Foundation for Industrial and Technical Research at the Technical Institute of Norway].

"The studies we will conduct for the ESA will give us new knowledge that we can then use in our offshore activities. Thus, it will pay double dividends," Paasche added.

There are many similarities between the working environment on the ocean floor and in space. Both require the best possible utilization of small areas. People must spend long periods of time under extreme conditions. This places high demands on safety, the environment, and the human qualities," he said.

SINTEF's part of the ESA studies is based on close cooperation with other Norwegian and foreign research institutes and industrial companies. In Norway, SINTEF is joined by the Institute of Toxicology and Pharmacology at the University of Trondheim (UNIT), NUTEC of Bergen, and Statoil. In West Germany the industrial firm MBB is participating in the project, while Aeorospatiale is representing France.

"During the initial phase, the Norwegian researchers will study the human side of long stays in space. We have also been commissioned to study how such aspects of the environment as light, air, gas, temperature, and humidity can affect people under the extreme conditions of space," Paasche said. The ESA project will also draw heavily on the Americans' experience with space shuttles. During the initial stage, the Norwegian researchers will evaluate the existing body of knowledge to determine which areas will require additional research.

Norway Plans Low Orbiter Satellite Launch Base

36980059b Oslo AFTENPOSTEN in Norwegian 18 Oct 88 p 72

[Article by Rolf L. Larsen: "Fishing Village Could Become Space Base"

[Text] An area near the fishing village of Nordmela on Andoya may become Western Europe's first satellite launch base. Ten launches per year could place satellites in a low polar orbit 300 km above earth to gather data for industry and research. The plans also include a new control station on Svalbard, but the Okse Base on Andoya is at the center of the European space project. The final decision will be made early next year, but a preliminary project is well under way.

"The Andoya project could give Norway a more prominent position in European space activities and it will support the government's goal of creating jobs in North Norway," said Arne Gundersen, section chief for space research at Norsk Romsenter. He is now head of a joint European group that is evaluating the construction of the first launch base in Europe.

Rockets And Satellites

The study group has now evaluated five areas on the west side of Andoya. An area south of the fishing village of Nordmela is the best alternative.

According to plans, the launching pad and the launch vehicle will loom large over the terrain of Nordmela. The rocket will be about 25 meters high—about as high as a 10-story building—and it will weight about 70 tons. The 4-stage launch vehicle has been named Litt-LEO—Little Low Earth Orbiter. It can carry a satellite weighing about 600 kg.

The idea is to construct a telemetry and control station in Ny Alesund that will be able to track the satellite and receive data from it. The satellite requires 1.5 hours per orbit and from Svalbard it will be possible to "see" all of its 14 passes per day. All the information from space will be transmitted automatically via Svalbard to the Okse Base on Andoya. The existing rocket launching station will be the "brain" of the entire project.

The satellites that will be launched can be used for various tasks and they will be of great use to industry and research. Examples include aurora borealis research, experiments under weightless conditions, and telecommunications. The satellite can also carry payloads that can be "guided" down from space to a landing site at Nordmela. This will give European researchers and engineers a chance to see the results of their experiments just a few hours after the launch.

Industrial firms in Norway, Sweden, Great Britain, and West Germany are now involved in the preliminary Andoya Base project. The Norwegian industrial group consists of Raufoss A/S, Prototec A/S, DNV Industrial Development (Veritas), AME Space A/S, Norspace A/S, and Norsk Romsenter.

"The Norwegian companies that are participating in the project will have a chance to make contacts and develop cooperation with British Aerospace and Royal Ordnance of Great Britain, MBB-ERNO of West Germany, and

Saab-Space of Sweden. Cooperation of this type could have important ramifications above and beyond this project," project leader Arne Gundersen said.

The Andoya project may also create a number of new jobs. This includes both the construction phase in Nordmela and at the Okse Base and permanent jobs for increased personnel at the new installations on the island group. Today there are about 250 people living in the fishing village of Nordmela. In a few years, fishing and space flight could live side by side in this tiny island community. The final decision will be made early next year.

Intospace Payload Launched by PRC's Long March

3698M040 Rome AIR PRESS in Italian 11 Oct 88 pp 1889-90

[Text] (AIR PRESS)—Protein crystals have been produced in space with the COSIMA mission, the Intospace payload. COSIMA was launched by the PRC's Long March II (CZ-2C) on 5 August 1988 at 4:28 p.m. from the Jiuquan base located in the autonomous province of Inner Mongolia.

COSIMA is the acronym for Crystallization of Organic Substances In Microgravity for Applied research. Intospace is a joint venture established in 1985 by Aeritalia, ERNO Raumfahrttechnik, and a number of other European companies to promote microgravity research. The FRG space agency, DFVLR, offered Intospace the opportunity to carry out this project after the China Great Wall Industry Corporation granted the BMFT two flight options last December for payloads to be launched by the Long March II.

COSIMA is based on an Intospace patent for a simple crystallization process for protein substances. The payload contains 104 samples provided by 13 researchers. The experimental instruments were manufactured in Bremen (FRG) by the prime contractor, MBB/ERNO Raumfahrttechnik, and the subcontractor, OHB-System, which is responsible for the electronic control box.

The mission lasted nearly 190 hours, 187 of which were devoted to the microgravity experiment. A similar experiment was simultaneously carried out at a ground station located near the launch pad to serve as a basis for comparison with the results obtained in space. The payload also included some reference crystals produced prior to the mission which were used to ensure that the stress undergone during the flight did not damage the crystals produced in space. No physical effect whatsoever was noticed on the reference crystals.

The capsule carrying COSIMA landed without damage at the predetermined location and was returned to Beijing on 14 August. The samples were returned to the researchers on 25 and 26 August.

It appeared that for at least seven of the experimental substances, the crystals produced in space were large enough to undergo crystallographic testing as well as comparison with those produced on earth. It will take a few weeks, however, to perform the full range of scheduled tests and to determine the microgravity effect. A second COSIMA mission is scheduled for August 1989 on another Long March II flight.

Glavcosmos Receives 'Era' Structure From CNES

3698A026 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English 22 Sep 88 pp 1-2

[Unattributed article: "'Era': The City Of Stars"]

[Text] CNES [National Space Study Center] has handed over the Era deployable structure to the Soviet space agency Glavcosmos. The Era, made by Aerospatiale, will fly aboard the Soviet space station Mir at the end of 1988 when the first European cosmonaut walks in space (Jean Loup Chretien or Michel Tognini). The purpose of the experiment is to demonstrate the feasibility of deploying a trellis structure under real nongravity conditions.

Several experiments will be made during the deployment and energization phase, to analyse reactions of the structure and measure vibration modes by means of an accelerometer. This structure is made up of carbon-fibre tubes interconnected by light alloy hinges. The French and Soviet cosmonauts will exit from the vehicle to attach the folded structure to its mooring unit at the exterior of the station. The structure will then be deployed by remote control and will have a diameter of 3.8 m.

The Era successfully underwent flight qualification testing in February at the Istres flight test center. The structure was fully deployed during the parabolic flight of an Airbus A300, which reached a new, near-perfect nongravity level for 4 seconds. Structures of this type will be used in the future for large-scale antennas and for the infrastructure components of orbital stations. The Era precedes the Hermes by some ten years and represents Europe's first experiment in extra-vehicular activities.

Italy's National Space Plan Programs Summarized

3698M043 Milan INDUSTRIA OGGI in Italian Oct 88 p 60

[Text] Italy has been a member of the European Space Agency since it was established, and has had its own National Space Plan since 1979.

The National Space Plan is on a 5-year programming basis and is updated periodically. The Plan was initially managed by the CNR [National Research Council], which served as a specialized operational facility. As of May 1988, it has been managed by the Italian Space Agency, under the supervision of the Ministry for Scientific Research.

The work program covers a wide range of activities, including marketing-related activities as well as technological and scientific research in fields such as telecommunications, propulsion, advanced structures, and the environment.

The companies that work for the Plan include: Aeritalia, Carlo Gavazzi Controls, Centro Ricerche Fiat, Centro Studi dei Sistemi, CISE, Contraves, CSATA, ELSAG, FIAR, FIAT AVIO, Italspazio, Italtel, Laben, Microtecnica, Officine Galileo, SAE, Selenia Spazio, SMA, SNIA/BPD, Telespazio, and VDS.

We will now briefly review the main programs.

Italsat: The objective of this program is to develop a prototype telecommunications satellite relying entirely on digital technologies that will provide an opportunity for testing operational solutions to be adopted in the near future. The satellite is scheduled to be launched by mid-1990.

Monomic: This program is based on the development of integrated electronic components using gallium arsenide technology. The objective is to develop 12 GHz receivers for direct TV broadcasting via satellite.

IRIS: The IRIS (Italian Research Interim Station) program aims at developing a propulsion stage capable of launching satellites weighing 600 to 900 kg from the U.S. Space Shuttle. The first IRIS flight is scheduled to launch the geodetic satellite LAGEOS-2 into orbit.

Tether: The Tethered Satellite System is a joint program with NASA to develop an integrated system formed by three basic units: a deployer, the tethered satellite, and the tether itself—that is, the connecting wire, which may exceed 100 km in length. This system offers the potential for carrying out scientific measurements and technological missions at a distance of up to 100 km from the Shuttle.

Sax: The objective of this program is the design and development of an astronomy X satellite, which will explore the universe in the 2 to 200 keV radiation band.

Telesurvey: A cooperation program involving Italy and the FRG for the development of an X-band synthetic aperture radar, to be installed onboard the Shuttle during the SIR-C mission for multispectral radar observation of the earth.

The program also involves the development of new processing architectures, optimized for preprocessing the data collected in telesurveys. The new system is based on the EMMA-2 multiprocessor, manufactured by Elsag.

Space Geodesy: A cooperation program with NASA for the direct observation of terrestrial motion and deformations in the earth's crust. The objective is to develop advanced space measuring instruments to acquire a better understanding of tectonic activity in the Mediterranean region. Laser techniques will be used with geodetic satellites that are controlled by fixed and mobile stations. Italy has relied on a laser ranging station located near Matera since 1983. A radiotelescope, optimized for the use of long-base stellar radiointerferometry (VLBI) techniques and developed by domestic industry, will be installed at the station. Another geodetic satellite, LAGEOS 2, will also be developed in cooperation with NASA. Finally, the PSN [National Space Plan] coordinates and funds scientific research activities conducted using satellites, space platforms, interplanetary probes, and stratospheric balloons.

Italy: CIRA Strategies Discussed

3698M039 Rome AIR PRESS in Italian
8 Oct 88 pp 1804-05

[Text] FORLI (AIR PRESS)—It will take 6 to 7 years for CIRA (Italian Center for Aerospace Research) to become fully operational with all equipment necessary to attain what has been referred to as a "critical mass." This, however, depends on whether bill no 2509, introduced at a parliamentary session on 23 March (see AIR PRESS No 16/88, p 733) by the then-Prime Minister Giovanni Goria and by nine other ministers, is passed in reasonable time; the parliamentary debate began last Wednesday.

General Lamberto Bartolucci, president of CIRA S.p.A.—a corporation established 9 July 1984 by 23 firms operating in the Italian aerospace sector for the purpose of setting up a research center—described the situation at a press conference held in Forli during the third SAVIA Exposition. Bartolucci outlined CIRA's objectives (developing applied research in the aerospace sector through close cooperation with industries and universities, since individual Italian firms are otherwise unable to bear the huge expenses that are incurred at present) and its current requirements: computational laboratories, technological laboratories, wind tunnels, a documentation center, technological plants, and power plants.

As AIR PRESS recalls, the first 35 billion lire allocated to the corporation shortly after its establishment was used to purchase a 170- hectare building lot near the Capua airport. The money was also used for investments in computers and basic equipment totaling 8.5 billion lire; another 5 billion went to cover management expenses. An additional 35 billion lire is still available as a result of CIRA S.p.A.'s initial projects in the area of applied research and the corporation's shrewd investment policy.

"We are now ready to direct our efforts to the large-scale projects that we require," Bartolucci remarked "starting with wind tunnels, a low Reynolds number, and a high Reynolds number: these alone will cost 200 to 300

billion lire; our next step will be the development of a 50 billion lire plasma tunnel for experiments on satellite re-entry phases; the power plant will require an additional 50 billion lire."

CIRA S.p.A. currently has 16.1 billion lire invested in ongoing projects; the corporation has a total of 53 employees, including 27 graduates and 23 professionals, and is expected to employ 500 people by the time it is fully operational. Its staff will include experts as well as university graduates, who will train both at the center itself and abroad—particularly in the FRG, where CIRA programs have already aroused considerable interest.

In his speech, Gen Bartolucci emphasized the importance of creating a research center of this kind in Italy. Otherwise one risks having to go abroad for even the simplest research operations—a waste of money and of domestic human resources. Similar centers already exist in the UK, France, the FRG, the Netherlands, Belgium, Sweden, and obviously, in the United States. Before World War II, Italy's Guidonia center was among the most advanced in the world; due to political short-sightedness after the war, no effort was made to bring the center back into operation. It was only several years later, in 1969, that the Caron Commission recognized the country's need for such a facility. Yet it took many more years to implement the plan. The president of CIRA S.p.A. has described the activities that the research center is expected to carry out, but since AIR PRESS has covered this topic extensively, readers are referred to the relevant issues.

At the press conference, Eng Ermanno Bazzocchi of Aermacchi stressed the need to establish extremely close links between CIRA and industry. In this connection, he described what happened during the Tornado episode: "24 different MRCA [medium-range combat aircraft] models," the designer recalled, "were being tested in as many wind tunnels throughout Europe and the United States." Such a thing should never happen again, although exchanges with other countries are expected to take place as a result of the European integration process. Once CIRA is fully operational, however, these exchanges will really work both ways; all the more so since the organization has already been asked to carry out a number of research projects, in the field of electronics in particular, on behalf of CNES and other foreign agencies."

Prof Luigi Pascale questioned the legitimacy of allocating government funds to a private corporation, but was told that the bill itself, which is now being debated in the House, provides for a number of checks by government agencies. These agencies will also be represented on CIRA's board of directors and on the scientific committee; in addition, CIRA's activities fall within the province of the Ministry for Research. The organization was legally established as a joint stock company to speed up the administrative procedures and personnel recruitment, which will be handled in a different way than for government employees.

A release handed out at the press conference provides a full list of CIRA S.p.A.'s shareholders. AIR PRESS publishes the list here: Aeritalia Saipa (154 shares, 17.11 percent), Aeronautica Macchi (51, 5.66 percent), Agusta (154, 17.11 percent), Alfa Romeo Avio (24, 2.67 percent), Alven (3, 0.33 percent), Aviointeriors (6, 0.67 percent), Consorzio ASI (300, 33.33 percent), Elettronica (14, 1.57 percent), Face Standard (2, 0.22 percent), Fiat Aviazione (57, 6.33 percent), Industrie Pirelli (3, 0.33 percent), Magnaghi Napoli (10, 1.11 percent), Magnaghi Oleodinamica (10, 1.11 percent), Irvin (3, 0.33 percent), Magneti Marelli (3, 0.33 percent), Marconi Italiana (6, 0.67 percent), Microtecnica (21, 2.33 percent), Nardi (11, 1.22 percent), Piaggio (26, 2.89 percent), Selenia (21, 2.33 percent), Sistel (4, 0.45 percent), Snia BPD (16, 1.78 percent), Steti (1, 0.12 percent).

Aeritalia To Be Prime Contractor for Space Station Module

3698m038 Rome AIR PRESS in Italian
5 Oct 88 pp 1830-31

[Text] (AIR PRESS)—Undersecretary for Research Learco Saporito has approved an intergovernmental agreement (involving eight countries: the United States, members of the European Space Agency (ESA), Japan, and Canada) at the Washington headquarters of the U.S. space agency, NASA, for the permanent international space station, Freedom. The space station will be launched in 1996 and is expected to be fully operational by the year 2000. The platform, which will be built in space, will feature three habitable laboratories and one crew accommodation module. These will be transported by the space shuttle—19 such flights have been scheduled—and fitted onto the carrying structure.

Italy will be prime contractor for one of the four pressurized modules (laboratories and crew accommodation), which has already been scheduled for the European Columbus program. Two other modules will be developed by the United States, and one by Japan.

The order for the module has been placed with Aeritalia via the Italian Space Agency; 22 Italian and European companies are expected to be involved in this project which is worth some 1,000 billion lire. This is the most important industrial project ever undertaken by our country's space industry. The European Columbus program, which is to be implemented under the direction of the ESA and which was approved at the conference of European space ministers (held in The Hague in November 1987, see AIR PRESS No 44/87, p 1558) with an allocation of 5,000 billion lire (25 percent of the total will be supplied by Italy), is seen as one of the main components of the Freedom project. The program involves the

development of one of the orbiting station's primary laboratories (the one for which Aeritalia is responsible) in addition to another autonomous co-orbiting laboratory, as well as the relevant equipment, scientific activities, and links with national programs.

Undersecretary Saporito's meetings at NASA (his American counterpart was represented by a number of senior officials and by the deputy director in charge of the international space station program) gave him the opportunity to describe the newly-established Italian Space Agency (ASI) to the Americans. In fact, the Agency's president, Mr Luciano Guerriero, and its managing director, Mr Carlo Buongiorno accompanied the Undersecretary.

The NASA officials promptly congratulated the Undersecretary on Italy's decision to establish the ASI. Saporito proposed that NASA allow an Italian astronaut to take part in the Space Shuttle mission that will launch the Tethered Satellite, scheduled for 1991. The proposal was received favorably.

The Santa Maria project was also discussed at the Washington meeting; to celebrate the fifth centennial of the discovery of America in 1992, a tri-national telescope will be launched into orbit. The United States will contribute a Scout rocket, Italy will contribute the launch pad, located in Kenya, and Spain will contribute the platform that will carry the equipment developed by the three countries.

Activities of Italy's Selenia Spazio Described

36980045a Milan INDUSTRIA OGGI in Italian Sep 88 pp 14-18

[Article by Anna Falzoni: "Star Agreements"]

[Excerpt] Space activities, by their technological and financial complexity, are difficult for a single company to tackle. Selenia Spazio emerged from an agreement among leading companies in their sector, and has created a network of international ties.

Birth of Selena Spazio

A further indication of the changed government strategy was given by the launching of a process of rationalization and strengthening of the supply structure, including the important step of creating the first and sole company intended to operate only in the space field, and assigned a significant amount of resources, Selenia Spazio, belonging to the IRI/STET Group. Born at the beginning of 1983, the company originated from the merging of four operating realities already involved in space activities: the Space Division of Selenia, the Space Division of Italtel, CNC (Compagnia Nazionale Satelliti), and STS (Sistemi di Telecommunicazione via Satellite). The integration of these companies was further strengthened by the support of three shareholders: Selenia (60 percent of the capital), Aeritalia (25 percent), and Italtel (15 percent). On the one hand, Selenia Spazio takes over the heritage of the Italian space experience, matured, in the national context, by implementation of the San Marco program, the Alfa program, and particularly the Sirio program (the first Italian satellite for telecommunications experiments). On the other hand, it is a quality leap forward in the effort to create the industrial structure of a body with adequate capability to assume the role of "prime contractor" and no longer only of producer of individual equipment. The space sector has now left the pioneering stage and is entering the industrial phase: Selenia Spazio's goal is to enter this market, which is rich in development prospects, but in order to do so needs to reach a certain critical mass and a system-level capacity to be able to respond appropriately to the needs of future customers. Selenia Spazio is moving in this direction, benefiting from the skills brought from the various operational bodies from which it originated, while integrating and expanding the scope of the specialties. As of now, it is already capable, with its Space Systems Division and Ground Systems, of providing integrated systems composed of both ground stations and satellites. A significant push in this direction was given by the PSN [National Space Program], which foresees for Selenia Spazio an important role as prime contractor for the national Italsat program and awarding of relevant international contracts, such as Olympus and Intelsat VI. A further incentive could be provided by substantial and timely implementation of space activities of the applications type, that is, aimed at practical use of the "space system," such as earth observation and space telecommunications programs.

Extensive Cooperation Network

The various contexts in which Selenia Spazio's activity is taking place are listed in the table, which shows the main national and international cooperation relationships in which the company is participating. This operating mode applies to all the production activities, because of the already cited technological characteristics of the space sector.

By way of introduction, it is worth clarifying that implementation of space programs involves a large number of companies, often much larger than might appear. This is because the overall organizational structure, normally directed by a company that assumes the role of prime contractor of the entire project, is divided into various segments, at the level of subsystems and equipment, each under the responsibility of a prime contractor to which report a further group of subsuppliers of specific parts and components. This particularly complex structure is characteristic primarily of the international-level programs; one example, in this respect, being Columbus, the first permanently manned space station with European crew, which could be completely self-sufficient, or be linked in larger orbiting complex with American and Japanese units. The project, developed on behalf of ESA, the European Space Agency composed of 18 countries (France, Germany, United Kingdom, Italy, Belgium,

Spain, the Netherlands, Denmark, Ireland, Sweden, Norway, Switzerland and Austria), is in fact divided into various segments: pressurized module (PM), resources module (RM), platform (PF), and service vehicle (SV), each assigned to a prime contractor under direction of MBB/Erno (Germany) in regard to the architecture of the entire system. In the context of each segment, various companies then have responsibility for the individual systems. For example, Selenia Spazio is responsible for the telecommunications subsystem for the pressurized module as the subsupplier of Aeritalia, for the resources module of Dornier, and for the platform of British Aerospace; and is further responsible for the interconnection system and the unit for interface with the network for Data Management System as subsupplier of Matra.

The Columbus project is not the only field of cooperation in the ESA context that Selenia Spazio is involved in; to the contrary, as can be seen from the table, a majority of its programs are commissioned by the European Space Agency. This is the result of the activism on the international level that has characterized Italian space policy, which, as already noted, turned mainly abroad until the beginning of the 1980's, with a marked gap between resources (though rather scarce) directed to European programs and those absorbed by national programs. Lacking a stable and adequate internal support, the industries had not,indeed, been able to develop the necessary experience, and, on the international level, were as a result not sufficiently qualified compared to the other countries that had established their own space activity (in particular, France and Germany). This situation resulted in a persistent deficit in the "fair return" in terms of fallout to the national inudstrial structure from the resources directed to the ESA programs by the Italian Government.

Italsat Program

The year 1984 marked a reversal of trend with a doubling of total expenditure for space activities and, for the first time, a balance between internal and external activities, in confirmation that the necessary awareness is developing to create also the internal conditions for a major development of the Italian industrial capacities. On this front, Italsat's national program is of particular interest, in which Selenia Spazio is filling the important prime contractor role. The objective of this program to develop, in the context of the national telecommunication network, an integrated system for high-traffic-density telephone and data links. The design and technology of this system are extremely advanced and could put our space industry in a leading edge position on the world level, putting it in condition to compete on equal basis with the other Western countries to assure it a slice of the market in commercial telecommunications via satellite, which is rapidly expanding, particularly in the emerging countries. That would also give Selenia Spazio, particularly in its prime contractor role, the credentials to present itself as a satellite producer for the developing countries, taking a further step forward in relation to its current position as subsupplier of parts in the cases of Arabsat and Insat. Unfortunately, significant delays have arisen in the development of Italsat, which is to be launched in 1990, just as delays are also marking the launching of other, similar projects, Sarit (Italian Broadcasting Satellite), which represents Italy's response to the direct television satellite projects of the other European countries (primarily France and the FRG), and Sicral (Italian Secure Communications and Warning Satellite). This is a strongly negative factor, because if we do not hurry, above all in regard to direct broadcast of television programs, our market could be invaded not only by products, as happened in the past with color television, but also by foreign programs.

The creation of an independent research capability is an essential condition for success in seizing the opportunities for scientific and technological advancement offered by the international programs. In order for the cooperation projects to be successful, what is needed is not only that the parties involved commit themselves to transfer resources, but that they also be capable of adopting and using the contributions of the partners. The capabilities for which Selenia Spazio has received recognition also on the international level by participating in important programs (for example, the Intelsat, to put into orbit and manage "commercial telecommunications satellites," in which Selenia Spazio has been regarded since 1968 [as published] as sole Italian partner) require a continued research effort in order to be maintained and improved. The existence of a significant and qualified public demand thus assumes a fundamental role, not only in making space services of public interest available, but also because, by giving the national enterprises in the sector the opportunity to venture into projects with high technology levels, it enables them to develop that heritage of indispensable skills to be able to cooperate profitably with foreign partners.

Main Cooperation Ties of Selenia Spazio [SP] in Context of the National and International Space Program

Program	Contractor	Role of SS	Partners	Value of Contribution	Stage of Completion	Note
Italsat						
Preoperational experimental telecommunications satellite	National Research Council (CNR	Prime contractor for development, implementation, and integration of the IS satellite for supply of all the on-board and ground telecommunications systems	Italian companies—Aeritalia, FIAR, Laben, GIE, SNIA, BPD, Gauled. Foreign companies—AEG (Germany), Aerospatiale (France), Matra (France), Ford (U.S.), etc.	Total value about 335 billion lira. Value of SS contribution about 163 billion lira	Activities under Development	Expected launch: beginning of 1990. Selenia Spazio is responsible also for the design and implementation of the ground segmen
Tethered						
Satellite tethered by cable to the space shuttle	CNR and NASA	Responsible for the RF part of the telemetry and telecommand	On the Italian side the partners are: Aeritalia, FIAR, SNIA and BPD	—	Activities under developmen	
Iris						
Propulsion system to insert satellites in use orbits	CNR	Responsible for telecommunications system	Italian companies: Aeritalia, FIAR, Microtecnica, SNIA, BPD	—	Activities under development	
Sax						
National scientific satellite for astronomical X-rays research	CNR	Responsible for the RF part of the telemetry and telecommand	Italian companies: Aeritalia, FIAR, SNIA, BPD, Telespazio	—	Activities under development	
Olympus (LSAT)						
Advanced Telecommunications Satellite	European Space Agency (ESA)	Responsible for the entire telecommunications system of the satellite, the design and production of the mission's two payloads, the direct television broadcasting and 20/30 GH2 telecommunications, and integration of the payloads of the other missions assigned to other industries (British Marconi and British BTM)	British Aerospace (U.K.) prime contractor, Aeritalia (Italy), Fokker (the Netherlands) and SPAR (Canada)	Total value 500 billion lira. Value of Selenia Spazio contribution about 220 billion lira	Activities in process of completion	Planned launch: 1989. The ground systems division is also participating in the program by developing three ground stations for monitoring and testing in orbit of the direct television broadcasting and special services payloads

Program	Contractor	Role of SS	Partners	Value of Contribution	Stage of Completion	Note
Meteosat Meteorological satellite	ESA	Responsible for design, construction, integration and testing of the antennas, data processing, data telemetry, telemetry and telecommand	Aerospatiale (France) prime contractor, MBB (Germany), ANT, ETCA (Belgium), Marconi (U.K.)	Value of Selenia Spazio contribution about 36 billion lira	Beginning production of flight models	
Ers 1 Telesurvey satellite for study and checking of the oceans and polar ice-caps	ESA	Responsible for design and supply of the altimeter radar	Industrial consortium led by Dornier System (Germany)	Value of Selenia Spazio contribution 65 billion lira	Stage of Completion: Activities under development	Planned launch: 1989
Hipparcos Satellite for astrometry	ESA	Responsible for development of telemetry and telecommand equipment, and relative testing systems	Matra (France) prime contractor, Aeritalia (Italy), BAE (U.K.), Erno (Germany), Saab (Sweden), and other smaller industries	Value of Selenia Spazio contribution 4 billion lira	Aactivities in completion stage	
Columbus Manned space station that will be able to operate independently or joined with the American space station	ESA	Responsible for the telecommunications subsystem of the pressurized module (PM), the resource module (RH), and the platform (PF). Also responsible for the interconnection system, the interface unit with the data management system (DMS) network	MBB/EMO (Germany), responsible for the system architecture; Aeritalia (Italy), responsible for the PH; Dornier (Germany), responsible for the RM; BAE (U.K.) responsible for the PF; Aerospatiale (France), for the service vehicle; and Matra (France) for the DMS	—	Development stage was initiated on 1 January 1988	The major financers of this program are Germany (38 percent), Italy (25 percent), and France (14 percent)
Hermes Space shuttle	ESA	Responsible for the capsule recovery subsystem and parts of the DMS	Aerospatiale (France), prime contractor, and other French and German companies	—	Development stage initiated on 1 January 1988	The major financers of this program are France (45 percent), Germany (30 percent), and Italy (13-15 percent)

Program	Contractor	Role of SS	Partners	Value of Contribution	Stage of Completion	Note
Intelsat VI						
New generation of commercial telecommunications satellites	Intelsat Organization	Responsible for design, construction, assembly and testing of digital equipment for telemetry, transceivers for telemetry and telecommand, and various types of antennas	Hughes (U.S.) prime contractor, BAE (U.K.), MBB (Germany), SPAR (Canada), Thompson (France), and NEC	Value of Selenia Spazio contribution 40 billion lira	Activities in completion stage	
Arabsat						
Commercial telecommunications satellite	Arab League	Responsible for design, construction, assembly and acceptance testing of antenna and telemetry equipment	Partners: Aerospatiale (France) prime contractor, Ford Aerospace (U.S.), MBB (Germany), and Mitsubishi (Italy)	Value of Selenia Spazio contribution about $3 million	Activities in completion stage	The ground systems division is participating in the program by developing and installing ground stations for links with the Arabsat satellite
Insat						
Program: Satellite for telecommunications and meteorological observation	India (Department of Space)	Responsible for design, development, assembly and acceptance testing of antennas and telemetry and telecommand transponders	Partners: Aerospatiale (France) prime contractor, Ford Aerospace (U.K.), and Mitsubishi (Italy)	Value of Selenia Spazio contribution about $3 million	Activities in completion phase	
ECS						
Operational satellite for commercial telecommunications	Eutelsat	Responsible for design, production and testing of the carbon and glass fiber antenna subsystem and the transponders of the telemetry and telecommand system	British Aerospace (U.K.) prime contractor, Matra (France), EMO (Germany), Fokker (Netherlands), and Aeritalia (Italy)	Value of Selenia Spazio contribution 8 billion lira	Activities in completion stage	

Source: Selenia Spazio and AIA (Association of Aerospace Industries), Report for 1986 Budget Year.

Billion Dollar Contract for Italy's Selenia Spazio Announced

36980045c Milan INDUSTRIA OGGI in Italian Sep 88 p 20

[Text] The director general of the IRI-STET Group, during a visit to the Abruzzi plant accompanied by Under Secretary for Scientific Research Learco Saporito, announced to L'Acquila town that Selenia Spazio will be the prime contractor for a major telecommunications program, the DRS, in the context of the ESA programs. The DRS communications system is the largest European program in the sector. It will provide the links and data transmission between ground and the modules of the Columbus space station, the Hermes space shuttle, the Ariane V rocket and the polar platforms.

It will be composed of two satellites in geostationary orbit, two terminals for space users installed on satellites, an operations control center to manage the system, and terminals for ground users and craft in the air.

Between now and the launch, planned for 1995, the system will cost 1.2 trillion lira, 35-40 percent of which will be Italian responsibility between Selenia Spazio and Telespazio.

Selenia has full responsibility for the Italsat space system, which is to be integrated with the national telephone network in 1990.

Italian Contributions to Arianespace

36980045b Milan INDUSTRIA OGGI in Italian Sep 88 p 21

[Text] The successful launch of Ariane 4 opens the way to industrial exploitation of the new rocket.

Marco Pittaluga, director general of SNIA-BPD (FIAT Group) and responsible for the defense and space sector of the company, has stated that eight rockets will be launched per year.

SNIA Space Defense, one of Ariane's main partners and the largest of the Italian partners, has provided, for the most powerful version of the rocket, components equivalent in value to about 6 percent of the entire cost of 750 billion lira.

SNIA-BPD developed the solid combustion booster, the engines for separation of the various stages, the apogee engine, and the trim engines of the largest of the satellites put into orbit, the Meteosat.

Aeritalia provided the tanks, constructed in the Turin plant: they are cylinders 5.7 meters high and 2 meters in diameter, with a value of 300 million each. IRI-Finmeccanica is committed to provide 24 tanks per year, while a Turin company, Peyrani (industrial installations, heavy transport), carried out the complete production of the "launch platform," that is, the structure to transport the rocket from the assembly area to the "umbilical tower" that supports it and supplies it prior to the launch.

Selenia Spazio has signed a contract for 52 billion to produce the telecommunications antennas, the data and image processing system, and the telemetry command system of the Meteosat 8 meteorological satellite.

BIOTECHNOLOGY

EC To Submit Biotech Protection Proposal

36980053b Paris LE MONDE in French 3 Nov 88 p 31

[Article by Philippe Lemaitre, correspondent in charge of the European Communities in Brussels: "To Help Europe Catch up, Brussels Wants to Increase Protection for Biotechnology Inventions"]

[Text] European biotechnology inventions are inadequately protected by current community patents. To make up for this, the European Commission has just submitted to the 12 member countries a draft guideline that would set up a consistent system.

The Community's weaknesses in the leading sector of biotechnology are due in part to the fact that innovation is inadequately protected. Researchers emigrate to the United States. Those who remain in Europe hesitate to patent their inventions: because of discrepancies in legislations, their patents might not be recognized in other member countries and could thus easily be pirated. That is why they often prefer to keep their discoveries secret and stay with the same company in order to implement them; this is an obstacle to the dissemination of innovations within the Community and to the creation of a large market.

The main goal of the guideline is to provide a broad protection both for genetic engineering techniques and for the living organism they may yield. In practice, it will provide for legal recognition of the "patentability" of genetically-engineered products, in particular micro-organisms. Yet, innovation should not be frozen. Therefore, the jurisdiction will not prevent another researcher or manufacturer from using the same genetic engineering technique (for a fee) in order to create a second original living product, which would differ from the first and could also be patented. Situations of this type, i.e. chain discoveries, occur mostly in plant biology.

New Labs Of National Agronomical Research Institute Inaugurated

36980078b Paris AFP SCIENCES in French 13 Oct 88 p 1

[Text] Jouy-en-Josas—President Francois Mitterrand, speaking to scientists of the National Agronomic Research Institute (INRA) on 7 October, emphasized the "preeminent place" that must be "assigned to research facilities" in France in "the economic war underway in the world, and that will determine our status as a great scientific and industrial country." The head of state, there to inaugurate a new complex of biotechnological laboratories at the INRA center in Jouy-en-Josas, reemphasized the "absolute priority" that he wants "to give to research policy."

The new building, which extends over 5,800 square meters, accomodates geneticians, physiologists, biochemists, morphologists, microbiologists and molecular and cellular biologists. It will make it possible to undertake both projects on animal cells and bacterias and viruses, and laboratory and field activities: research essential for the future of agriculture and the related industries.

"This building, dedicated to what have come to be called the biotechnologies, carries great hopes for the future," said the chairman of the board of INRA, Jacques Poly, to whom President Mitterrand had awarded the insignia of Commander of the Legion of Honor. "It is the manifestation of a renewal for our institution, which has the will to adapt its research agenda to the needs of the foreseeable changes in the agricultural and agroindustrial sector."

The president of the Republic then paid tribute to the work of the major national scientific institututions and underlined the complementary nature of basic and applied research.

After stressing the importance of agronomic research for French agricultural production and food industry, Mr Mitterrand criticized, without naming them, the reform projects planned by the Chirac government in the research field. "We wanted to reverse the trend and restore the confidence that the country should have in those engaged in the occupation of researcher," he said. "We go through periods of doubt and we praise the research that produces, however, we must not underrate the more basic research, the research that is by its nature more uncertain in terms of results." "People have criticized the major research institutions. They have seen primarily their weaknesses and declined to benefit from their strengths. At one time they even envisaged their dismantling," he recalled, adding with emphasis that "rather than seeking fruitless arguments, it is better to look for syntheses," in particular between public and private sectors.

Accompanied by the ministers of agriculture, Henri Nallet, and research, Hubert Curien, Mr Mitterrand visited several laboratories of this new building, approved in 1983, where research in genetics, new vaccines, reproduction and microbiology are conducted.

A total of about 250 will work in these new facilities (of whom 190 INRA personnel), including 111 scientists, 33 engineers and 35 young people preparing their thesis. Also, about 20 foreign researchers will participate in the investigations of the various teams.

Four Biotechnology Projects Under EUREKA Planned

36980044b Milan BIOTEC in Italian No 4, 1988 p 56

[Text] Submitted at the 6th EUREKA Ministerial Conference held in Copenhagen in June were 54 new projects, for a total value estimated at around 360 mecu; 19 of these projects involve Italian participation, 4 of which concern biotechnologies. The number of organizations—firms, research institutes, universities—taking part in the 160 projects submitted to date now totals some 800. Considerable emphasis was placed, during the conference, on the importance of COSINE project, which aims to strengthen the data interchange network in all activity sectors of European R&S, and to create marketing opportunities for the information technologies industry. The Council of EEC Research Ministers also emphasized the need to define as clearly as possible the interactions of the two R&S structures so as to avoid duplications and encourage maximum synergy. The incoming presidency will be exercised by the Austrian Government, and the 7th Ministerial Conference will be held in Vienna in June 1989.

The topics of the four biotechnology projects are:

1. Serological determination of syphilis through a complete system of reagents and computerized instruments; Italy has Spain as its partner in this project.
2. Development of technologies for increasing the sensitivity and specificity of nonradioactive tests in the solid phase with monoclonal antibodies; Italy has Switzerland as its partner in this project.
3. Development of diagnostic reagents for the screening of blood donors for hepatitis and lymphotropic retroviruses, particularly HTLV-1 and HIV; the partners are Turkey, Spain and Italy.
4. Genetic improvement of cereals through RFLP [Restriction of Fragment Length of Polymorphisms] techniques; participants in this project, in addition to Italy, are: Portugal, Turkey, the Netherlands, France and Germany.

COMPUTERS

Basic Research Under ESPRIT II Detailed

3698A034 Brussels EC PRESS RELEASE in English No IP(88) 710, 17 Nov 88 p 1

[Report: "ESPRIT Basic Research Launched"]

[Text] The second phase of the ESPRIT Programme, approved by the Council of Ministers on 11 April 1988, includes a chapter on basic research for the first time, with a budget of ECU 65 million of Community funding. Basic Research in Information Technology covers many different areas which underpin the main ESPRIT programme of industrially-oriented precompetitive research and development. These areas include high-temperature superconductivity, optical computing, concurrency, specification and verification of complex software systems, neurocomputing, robotics, and speech and vision processing.

The Commission has approved 62 proposals under the basic research chapter of ESPRIT, representing 21 percent of the proposals submitted under the First Call for Proposals for Basic Research Actions in Information Technology. Contract negotiations are now starting with the universities, research institutes and companies involved.

The ESPRIT Basic Research Actions will maintain and expand a reservoir of knowledge and expertise in the scientific foundations of information technologies through ambitious, often interdisciplinary, research which requires European collaboration.

The First ESPRIT Call for Proposals for Basic Research Actions was published in March 1988, and closed on 13 June. The 283 valid proposals received represented a total funding of ECU 485 million, or eight times the total ESPRIT Basic Research budget. The response was also of very high quality, involving virtually all the teams of renown working in the forefront of basic information

technology research. As a result, only proposals of exceptional quality and promise could be selected, and the duration of funding was limited to two and a half years.

Subject to the outcome of contract negotiations, it is expected that the 62 proposals selected will involve the participation of 285 different organisations. This participation is divided between universities (74 percent), research institutes (20 percent) and industry (6 percent).

The Commission believes that the proposals chosen as a result of this severe selection represent a strong and wide-ranging European research effort which will provide a sound basis for key future technological developments in the areas addressed. The proposals also define a standard of attainment and quality only achievable through transnational collaboration.

Nixdorf Hopes New Policy Will Save Company

36200086z Hamburg DER SPIEGEL in German
28 Nov 88 pp 110-111

[Unattributed Article: "Nixdorf: 'We Must Fight Like Never Before'"]

[Text] The leading edge company of the West German electronics industry is now suffering setbacks after a long series of shining years. Sales remain far behind expectations, and stocks and profits are falling. Now a flood of red numbers is threatening the company unless decisive action is taken.

The 2 weeks of relaxation which Klaus Luft allowed himself on the golf courses of Mallorca at the end of October certainly were the last introspective days before an icy winter. Just after he returned to Paderborn, a flood of bad news swamped the man who, since March 1986, has been charting the destiny of Germany's second largest computer manufacturer (after Siemens).

A crisis atmosphere reigns at the Paderborn company. The computer firm's product array is splintered and outdated, and prices are barely competitive.

Nixdorf is the name which, up until the beginning of 1988, still gave the Germans the feeling they were not left completely dependent upon competition from the United States and Japan.

For years, up until his death in 1986, the eccentric company founder Heinz Nixdorf with an ingenious sense for money and business led the firm over all obstacles from success to success. Like none of the other German computer pioneers, the inventor from Westphalia understood how to make money on a grand scale out of technical advances. The Nixdorf firm, begun in a basement workshop, grew into a company with over DM5 billion in sales and 30,000 employees.

Nixdorf's successor, Klaus Luft, 47, had wanted to powerfully extend the success story. "Certainly," says the ever self-assured Luft "we could also take on IBM."

That will certainly take some time. For months, indications have been mounting that much is no longer as it should be at this successful company, which in its best days had an image even better than Daimler Benz'.

It began with a whole series of fraud cases which put Nixdorf in the headlines. And it continued with increasingly clear indications of a case of economic weakness.

For the first time in the history of the company, the growth in sales was significantly under 10 percent. The profits caught the Paderborners even more severely. According to expert opinion, with its relatively meager DM150 million in earnings, Nixdorf had to swallow a full 40 percent drop as compared with the previous year.

What appears at a casual glance to be just a business accident is in reality the result of unfavorable trends which were foreseeable long ago. Many things have fallen into place at the former darling of the markets. Homemade mistakes, a slump in the German computer market and new foreign competitive aggressiveness form a dangerous mix.

An internal analysis of the "profit structure" depicts a bleak picture. If Nixdorf continues as in the past, then the company will be stuck solidly in red numbers within 5 years at the latest.

In expectation of perpetual repetition of the accustomed successes, Luft was still fully planning on expansion in mid-1988. In just 18 months, the company hired 5,000 new employees, while at the same time the chairman of the board was pushing ambitious projects ahead.

Luft, whose firm has primarily catered to service companies and mid-sized corporations in the past, wanted to break into the industrial manufacturing and central corporate computer parks with new powerful computers. An extremely expensive new beginning was staged on the North American market, where the Paderborners are relatively unknown despite year-long efforts.

On top of all that, Luft pushed through a project of almost historic proportions: All in-house computers and dozens of programs, some of which have been in service for decades with customers, are being converted to a new operating system by the name of Unix. The new beginning is overdue.

Nixdorf's day-to-day business with the middle class and the banks is still based today on a dated system from 1976, which is certainly a unique case in the quick-turnover business. Nixdorf functioned successfully with the old equipment in the past because the complete in-house solutions were so thoroughly tested and refined

that the customers simply accepted the old basic technology. Luft rested on his campaign slogan, "We don't sell memory, we sell brains."

That does not suffice any more in a time when earning money in computers has become more difficult than ever before. The industry is striking itself with price wars in previously unknown severity, the lower dollar is making export more difficult for German firms and imports easier for foreigners, and the large industries and banks are holding back with new orders.

"We must fight like never before for each sale," claims Luft.

This is true for the others, too. Nixdorf, though, has one other special problem to struggle with: as a specialist for the so-called mid-range data processing technology, Luft neglected the personal computer (PC) business. It is precisely this market segment which is waiting for the specialists with growth rates of 70-80 percent.

The PCs, which have become quite powerful themselves, have taken over tasks in management and offices for which much more expensive Nixdorf machines were acquired in the past. With the new powerful PC operating system OS/2, market leader IBM wants to teach the meaning of "fear" to the competition in this segment. OS/2 works in almost any size of network (called the "token ring"), can be tied to the central computer with little effort, and is the first uniform system for office and management.

In Germany alone, IBM has pulled over a thousand employees out of production and management to use them more effectively in sales. The new aggressiveness on the part of the market leader hits no other competitor so hard as Nixdorf.

Luft wants to react now. Money is to be saved at Nixdorf, and the firm is to concentrate on the truly profitable business. Luft: "We need a new corporate culture." The corporation must, according to the Chief, become the "system integrator."

Machine production will no longer stand in the fore at Nixdorf, but instead consultation for customers—regardless of which computer brand they chose.

From computer manufacturer to free-swinging problem solver? The strategy could prove risky, and could turn Nixdorf into yet another software supplier which would be in competition with many other firms.

Finally, Nixdorf has brand new factories in Paderborn, Berlin, and Singapore which must be utilized. And, as a software newcomer, Nixdorf is entering territory served by the likes of SAP, Softlab, or Cap Gemini.

Such objections do not irritate Klaus Luft. Accustomed to success, he sees himself out in front again: "Other software houses do not have such a broad base as we do."

Exercising caution, the Nixdorf boss still asks for a grace period. "The years 1988 and 1989 are transition years." After that, "in the beginning of the 1990s," Nixdorf should come out ahead again: "Until that time, the transformation will burden our business."

FRG Institute Uses Transputer for Biotechnology Research

36980040a Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Oct 88 p 8

[Article by Bernhard Rose: "Transputers Replacing Supercomputers in the Search for New Proteins: Rapid 'Molecular Modeling' as Pilot Project of the Association for Biotechnology Research"]

[Text] Braunschweig—For the first time in the history of computer technology, which has traditionally been dominated by American companies, the development of a new processor and a new computer architecture is coming from Europe, the implications of which will result in more than just a quantum leap on the performance scale of computers: The transputer is a processor development of the English company Inmos. The word transputer is a combination of the words transistor and computer. What is unusual about the transputer is the structure of these new computer chips which, once connected in a large number and installed in a computer, are able to handle an extremely high number of computing operations per time unit. However, the truly revolutionary thing about this technology is the price-performance ratio achieved by these transputers.

The Association for Biotechnology Research (GBF) is working together with computer manufacturer Commodore in Braunschweig on a joint project involving a graphic transputer super-workstation for molecular modeling in protein research. Based on the Commodore Amiga 2000, this PC-size computer should be able to process up to 170 million instructions per second (mips). This means 17 parallel transputer components, each with an output of 10 mips. As a comparison, graphic desktop workstations, such as those offered in the upper range today, can achieve a maximum of seven mips—for example, the SUN workstation 4/110 for around DM 50,000. According to information from development leader Dieter Preiss, the Commodore transputer, also with a 32-bit data range, should be below this cost level.

Prof Dr Karl-Hajo Siemsen of the trade college in Emden says that even a price-performance factor of 100 is possible within 6 months after the first transputers come onto the market. For example, the performance of a current supercomputer in the DM 10 million range could in this way be fit into a computer for DM 100,000. However, this is just the beginning, says Siemsen, who is already talking about factors between 500 and 1,000 (especially for Cray-class supercomputers), factors also

mentioned at an international transputer conference held several days ago in the southern English city of Portsmouth. How is this tremendous jump in performance possible?

Expressed in simplified terms, transputer components are complete, extremely high-performance smallest computers located on one chip. In a transputer, a single highly-integrated chip contains the elements—such as the central processing unit (CPU), memory and coprocessors—that in standard computers are positioned separately and internally connected by way of rapid data links (bus lines). The latest 32-bit transputer component, the T-800 by Inmos, performs 10 million computing operations per second. Its market price is around $1,000.

An enclosed, ready-to-be-installed component of this sort has an edge length of approximately three times three centimeters. Aside from its high level of individual performance and the miniaturized configuration, the design is still in keeping with the standard computer architecture described around 40 years ago by Neumann, Burks and Goldstein. The trick now is to interconnect several of these transputers, and in particular to organize their work in such a way that they are able to handle the individual steps of extensive computer programs—such as simulation tasks—in parallel without getting in each other's way when accessing data. This takes place in a relatively small number of standard computers, which are cross-linked in a so-called cluster, so that eventually computing speed ceases to increase.

A prerequisite for functioning is a suitable controller. Consequently, the problem was to develop suitable operating system software so that this type of synchronization is possible by appropriate communication among the individual transputers. In the meantime, this has been achieved by Perihelion, also a British firm. Helios, which is the name of the operating system for transputers, has been on the market for a few months. One of its special feature is that part of the operating system software is stored on each transputer component, and this software element takes care of the logical interconnection of the transputers whenever they work in concert on a computer program.

Although in terms of computers this means that the precondition for "a powerful quantum leap in computer technology has been met," as Prof Siemsen says, at present there is no suitable applications software. This is because the existing programs for science and technology that are in use today cannot exploit the speed advantages of parallel processing using several transputers without modifications in that software. Several software houses are already working on this problem, including Proteus, a firm in Karlsruhe, which is currently rewriting its CAD program for transputers. However, ideal applications include all programs with a large number of similar computation sequences, such as graduated depictions of volume or flow calculations, but also the finite element method (FEM), the starting point for simulation calculations for deformations in mechanical component structures, for example.

On the one hand, the necessary software is currently lacking, and on the other hand new applications will emerge for which supercomputers have up to now been used rather sparingly for reasons of cost, such as in protein engineering. For example, the pharmaceuticals and chemicals industry has a great deal of interest in so-called molecular modeling or "drug design," whereby computers are used to develop new medicines and pesticides more efficiently, for example.

Specially targeted towards this application is the joint pilot project begun 6 months ago by the BGF [as published] major research institute in Braunschweig and Commodore. To this end, Commodore is currently equipping its PC workstation with transputers and the new Helios operating system, while the BGF [as published] is adapting its Bragi software program (developed specially for modeling proteins) to processing using the new operating system. Project leader Dr Dietmar Schomburg of the GBF estimates that the first version of the modified software for transputers will be ready in another 6 months.

According to Schomburg, the goal of the project is "to develop inexpensive, high-performance workstation computers so that, within the relevant companies, as many chemists and molecule modelers involved in research as possible will have at their work place their own graphic workstation with the performance of a current supercomputer in the foreseeable future." Dieter Preiss, head of development for Commodore in Braunschweig, believes that the transputer is even more superior in technical terms. Networking a large number of transputer workstations creates the possibility of using all the computation resources of the transputers included in this network from a single work place, since the Helios operating system does not care whether the transputers are all housed in one computer are distributed among several workstations.

The prerequisite is at least one transputer per workstation computer, as access to the "transputer world." Parsitec in Aachen already offers pure transputer clusters with 100 and more components produced by Inmos under the name Supercluster. This corresponds to a concentrated computer performance of one billion or more instructions per second.

The need for the chemicals and pharmaceuticals industry to have uncompromisingly higher computer performance is obvious. While it used to be possible to bring a new substance onto the market after testing 3,000 to 4,000 synthesized substances, the success quota for this search method ("screening") has fallen to one in 12,000. It can no longer be done using standard lab methods. In addition, there is enormous competitive pressure. "In

terms of the number of newly developed active substances, the Japanese pharmaceuticals industry has already passed German manufacturers, and is now in second place behind the United States," warns Hans Ruediger Vogel, managing director of the National Association of the Pharmaceuticals Industry.

Thus, the new basis for more effective research is an exact knowledge of the correlations between tailor-made molecule structures and their functional mechanisms. In the foreground here is research on the causes of disease and the question of which receptors, enzymes or genes must be effected in order to cure the disease in question. Moreover, concerted projections of effective compounds using computers and the corresponding software reduces the high number of necessary animal experiments, and will, in Dr Dietmar Schomburg's assessment, make it possible to reduce that number even further.

DEFENSE INDUSTRIES

MATRA, SEP Plan To Form Joint Subsidiary

3698A024 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English 20 Oct 88 p1

[Text] Matra and SEP [European Propulsion Company] are planning on creating a joint subsidiary to handle image and data (T2i) processing for control applications. The project has been submitted for authorizations and consultations. Matra will hold 65 percent of shares and SEP 35 percent in the form of a transfer of total civil and military activities of both mother firms in these fields. Recently, Matra announced the creation of a new T2i division as part of its defence-space function. Its purpose will be to handle all data processing and transmission functions involved in military missions, from acquisition and analysis of target data and threats up to mission preparation and monitoring aids. SEP has applied new developments made by its image-processing division (SEPIMAGE) and its subsidiary NUMELEC (recently merged with SEPIMAGE) in the field of space image-processing stations, reforming systems and image-processing units. This will make SEP one of the world's foremost experts in teledetection. Earlier, in 1986, Matra and SEP joined forces in the remote detection field by establishing a group for coordination in the SPOT [Earth Observation Satellite] and Helios programs. The future firm will be part of Matra's Defence Space Branch and will employ nearly 450 persons. In 1988 these activities will represent Fr 500 million.

Development of 'Mistral' Missile Nears Completion

3698A027 Paris BULLETIN DU GIFAS in English 22 Sep 88 pp 2-4

[Article: "Matra 'Mistral'"]

[Text] Late in 1980, Matra was selected to design a light, versatile anti-aircraft defense missile to meet the requirements of the French Air Forces and Navy alike.

The threat to be countered was, on the one hand, that of aircraft flying at very high speed rates and at very low altitude, and on the other hand that of anti-tank helicopters, which constitute a real menace to battle-line units by reason of their reach, quickness and versatility. Furthermore, the Navy also needed a missile capable of stopping sea-skimming anti-shipping missiles.

Five Seconds To Reach 3,000 Metres... for an 18-kg Missile

Matra is completing the development of Mistral, a light-weight missile to be mounted, in its basic Manpads configuration, on a tripod. The unit, easily carried by 2 men, can become operational in under one minute.

Mistral can successfully tackle a fighter plane's forefront attack at a distance of 6 km, or a hardly perceived helicopter hovering 4 km away.

The missile's performance as to speed rate (Mach 2.5) and as to maneuverability enable it to counter any evasive attempts technically available to present fighter aircraft. This results from the advanced design of its streamlining (including the pyramidal irdome), from its flight controls, as well as from its piloting laws combined to a high specific impulse and low-combustion-time rocket motor.

Multicell Homing Head and Optimized Payload

With its passive infrared homing head, Mistral is a fire-and-forget type missile, therefore requiring no attendance once it is released. This enables the firing crew to resume operation at once, affording in some instances bursts to be fired at different craft of the same patrol.

The fire-and-forget design philosophy enables the firer to tackle a fast-maneuvering target, a capacity lacking in many missiles of this class, since their control by marking on a laser beam requires the operator to keep an accurate aiming at the target until the blow.

The very highly sensitive homing head is derived from the Magic-2 homing head, using for the first time in the world the multicell technique together with a digitized signal processing. The Mistral is thus unaffected by infrared decoys.

A 3-kg warhead (2 to 3 times heavier than other missiles of this class) is combined with a laser proximity fuse, providing the required efficiency against maneuvering aircraft, against armour-plated helicopters or against anti-shipping missiles.

A Single Missile for Various Assignments

Fitted with a night-time sighting system and an IFF (friend/foe identification unit), Mistral is suited to various assignments: self-protection of convoys, defense of air fields or strategic facilities (industrial or nuclear plants...), self-protection of vessels at sea, etc....

The missile being altogether identical in all cases, various contrivances are under development in addition to the portable Manpads or bimunition Albi versions designed to be connected to a firing control station.

There is the Sadral marine versions designed for anti-aircraft and anti-missile defense (6-missile multi-target turret, remote-controlled from the ship's operation center); there is the Simbad version (plain two-missile mounting), designed for the self-defense of light vessels and logistic ships. Sadral is ordered by the French Navy and one foreign country. Two turrets are now sea-tested aboard the Cassard frigate.

Besides, there are 2, 4 or 6-missile turrets or mounting arrangements, adaptable on various types of plain or armoured light vehicles (M113, VAB, ACMAT, etc.) to escort convoys or to be deployed around air fields (possibly integration on a semi-mobile shelter). Actually, the French Army is to be provided with Santal systems made up of a turret with 6 ready-to-fire Mistral missiles, plus a Rodeo-2 radar, plus a thermal camera, fitted on a six-wheel-drive ERC Sagaie armoured car.

Furthermore, the homing-head searching capacity along the missile's axis (a novel feature denied to other missiles) affords finalizing a helicopter-mounted AATCP (very-short-range-air-to-air) version, clearing the way for air-to-air combat between helicopters.

An agreement between Matra and McDonnell Douglas has led to confirmation that the Mistral missile can be adapted on the American combat helicopter Apache. It may be remembered that the Matra Mistral will as a first step be fitted to the French Army's Gazelle helicopters and to the Franco-German HAP-HAC combat helicopter.

First Order: 2300 "Mistral"

Various target firings were made, first at the Centre d'Essais de la Mediterranee, then at the Centre d'Essais des Landes. The missile's piloting performance, its maneuverability, the satisfactory operation of the homing head and the final efficiency of the 3-kg warhead fitted with a proximity fuse have been fully demonstrated. Following manufacturer firings which took place in March 1988, the French Department of Defense has notified Matra of a first contract for 2,300 Mistral missiles. The first deliveries are scheduled for the fall of 1988.

The industrial production of Mistral is under way. Matra is preparing for the production in tens of thousands of units.

Development of NH 90 Helicopter Detailed

36980043b Rome RIVISTA AERONAUTICA in Italian Jul-Aug 88 p 89

[Text] On 17 March, during the meeting of the NH 90 program steering committee, held at the Cascina Costa offices of the Agusta Group—Note: The NH 90 is to be the new European helicopter of the 1990's for ground transport and antisubmarine warfare—the representatives of the interested Governments (France, Germany, Italy and the Netherlands) examined the government-proposed solutions and evaluated the technical proposals submitted by the industries represented by Agusta, Aerospatiale, MBB, and Fokker.

The NH 90 is to be a helicopter of the 8-9 ton class, with a market estimated at 700 units, based on the requirements of the participating countries. Added to this figure will be the units to be exported.

For the Agusta Group, prime contractor of the NH 90 program together with Aerospatiale, the development of the helicopter represents a further opportunity, in keeping with the company's strategic objective, to participate in an international undertaking. In this regard, it is recalled that the Agusta Group is also working jointly, in a 50-50 partnership, with the British Westland group, on the development of the EH 101 medium-heavy helicopter, and is the leader of the "Tonal" program—the future European multi-role combat helicopter, which is to be derived from the A-129 Mangusta and which is to be built by the Joint European Helicopter consortium consisting of Agusta, Westland, Fokker, and CASA. In addition, Agusta is also participating in the development of the Eurofar, the European convertiplane, under the Eureka program.

Eurolins To Develop EFA's Inertial Navigation System

36980043d Rome RIVISTA AERONAUTICA in Italian Jul-Aug 88 p 88

[Text] Four of the most advanced European industrial firms in the field of avionics—Litton Italia, Honeywell Sondertechnik (Germany), CESELSA (Spain), and Ferranti Defence Systems (Great Britain)—have formed a consortium named Eurolins for the specific purpose of designing and developing an advanced inertial navigation system for the future EFA [European Fighter Aircraft].

The name of the consortium is derived from, and identical to, that of the equipment it is developing: Eurolins is the acronym of European Laser Inertial Navigation System, and offers an immediate indication of the new system's principal characteristic: It is to be based on the modern technology of laser gyros.

The objective the consortium has set for itself is to develop a system that meets the technical requirements of the new plane while achieving the best effectiveness-to-cost ratio, and at the same time, to satisfy the national aspirations of each of the countries participating in the EFA program with respect to constant advancement of the state of the art in laser-gyro technology.

Founded on the basis of a common international objective, and with an equitable subdivision of the work and prime responsibilities, the Eurolins consortium fully reflects the spirit that motivated the creation of the project for the new European fighter of the years 2000

The four firms comprising the consortium all have vast experience in the design and construction of onboard electronic equipment, and especially of advanced-type navigational equipment, with special reference to application of the technology of laser gyros.

Litton Italia has among its assets the design and construction of the route-indicator and attitude-indicator inertial reference frame used on the Tornado, which was followed by detailed studies of strapdown technology, which was applied in the design of the reference systems for the AMX and for the A-129 and E-101 helicopters, as well for various other types of aircraft. Another high-technology-intensive project is the one in progress at this time for the integration of the inertial reference systems now operational with the worldwide system of navigation via GPS satellites.

Ferranti, a company that builds very advanced products, is carrying on similar work to which is added, however, the integration with the TRN [Terrain Reference Navigation] system. Ferranti has also, on its own, developed and flight-tested a LINS [Laser Inertial Navigation System] which essentially responds to the requirements of the EFA. The company is now studying the possibilities of using this technology for other applications.

Honeywell Sondertechnik is currently launching the production of a LINS of its own design and development. In addition, it is working on the upgrading of the LINS used in the F-4F's of the Luftwaffe, using a unit of equipment of its own production that was successfully flight-tested aboard a Tornado.

And CESELSA signed a contract in 1985 with the Spanish Defense Ministry to develop a LINS, the first prototype of which will be flight-tested during the coming months.

FACTORY AUTOMATION, ROBOTICS

New FRG Institute To Study Multi-Robot Systems

36980062a Hamburg DIE ZEIT in German 4 Nov 88 p 96

[Article by Gero von Randow: "The Robot Friend; On the Road Toward Intelligently Reacting, Autonomous Steel Men; A New Institute for Automation and Robot Research in Dortmund"]

[Text] You do not hear much about robots these days. The artistic offerings of the exhibition stars of yesteryear no longer astonish anyone and we now believe them capable of almost anything. To be sure, robots weld and grind, bore and tirelessly paint mass production goods in automobile factories and elsewhere, but it is quite difficult to adjust them for use on different models of cars. They are almost never used in assembly, a particularly cost-intensive part of manufacturing. Currently available robots are too single-minded to be of use in the usually complex and rapidly moving world of assembly. It is dangerous for anything that gets in the way of their iron fists. For that reason, industrial robots must, by law, be caged like lions and tigers in a circus.

Public interest in industrial automation has turned to other questions like the "factory of the future" or "computer integrated manufacturing." The "global view" is supposed to take in the integration of programmed systems in the work process. Those still fiddling with individual pieces of equipment hardly seem to belong to the avant-garde. Robots have lost the thrill of the spectacular.

That could change soon. Robot researchers are preparing to overcome the next obstacles on the road to "autonomous multi-robot systems"—that at least is what Professor Eckhard Freund says. Freund is the head of the Institute for Robot Research at the University of Dortmund. His goal: systems of several robots that can be programmed easily and rapidly for complicated and changing tasks and also can act intelligently in unpredicted situations.

That sounds good; still, there are some seemingly routine conditions to fulfill first—such as the requirement that the simultaneously operating robots not get into each other's way. That is far from trivial. "Collision avoidance" is hard for us just in driving, and with six-axis robots—if not before—it becomes incredibly complex.

Collision avoidance starts even before the robots begin to move. Their paths are programmed with the aid of language-formulated commands or with CRT graphics. But even the most modern central computer is no Laplace genius to know and predict everything. Furthermore, a factory is not an organism where every situation can be calculated out in advance; and even if every situation were well defined, it would require an enormous computing effort to provide for all the possibilities. Collision avoidance therefore also includes guiding the path of movement during operation. This online process is what particularly interests Professor Freund.

The data needing to be processed online come directly from the robot's sensors and indirectly from the guidance mechanism for its path of movement. But how is it possible to process the robots' preplanned paths, their varying speeds and power, priorities and current movement data into collision-free routes? The traditional answer is: by trial and error. The computer works through several variations and in a step-wise process

approaches a path model that is collision-free and also optimizes other functions such as speed and precision. However, that can take a long time, too long for most industrial tasks.

The procedure developed by Eckhard Freund and his colleagues operates faster. Every 8 milliseconds the system computer generates a picture of that portion of space in which a collision between robots could occur soon. Thus the computer is constantly sensing where there is danger of collision. Nothing else happens at first. "Permanently colliding robots" is Freund's name for this principle. But in reality there is no collision. As soon as the robots approach the critical area, the computer retrieves from its memory the precise program that will avert this dangerous combination of circumstances.

The effect is astonishing. In the new institute building—the moving cartons still have not all been unpacked—Eckhard Freund has reassembled his trial arrangement from the Hanover Fair: two robots of different makes move about in the same working area and elegantly avoid one another—and also an obstacle that I put in their way. The illusion of life is fascinating and terrifying. Centuries ago those who constructed clockwork dolls were brought before the Inquisition for precisely that reason.

The Dortmund robot researcher is not haunted by such thoughts; all too often the inadequacies of his apparatus remind him that machines lack the ability that comes from human intelligence. Of course that does not prevent him from considering how the robot programs' strengths can be used where our intelligence is inadequate. Professor Freund's team is working with Daimler-Benz on processes by which the robot collision-avoidance programs can be transferred to manage road traffic. The Eureka Initiative's Prometheus Program is financing this development. On the colorful simulation screens at any rate cars are already able to avoid one another skillfully. Real traffic, of course, is considerably more complex than a factory; and how we will react in a dangerous situation when a computer takes over the steering wheel is totally unknown.

Robot research is extremely physical and concrete. "Data processing alone will get you nowhere with us," says Freund and switches on a heavy robot. It makes a quick movement and the entire chassis shudders. Robots move a number of outstretched or rotating axes, they are complicated systems in which many undesirable interactions can appear. Adjusting these side effects in the individual axes so that the robot operates smoothly is a challenge to robot programming. Freund has the machine repeat its movement, this time, however, under the control of a new guidance process, and everything looks much better. "It's still shuddering a bit," he says disapprovingly.

One cause of this shuddering is the drives, where all sorts of mutually reinforcing rhythms can arise. Consequently it considerably reduces disturbances in the steel men if as many of their elements as possible are driven directly by the motors. Even more difficult to meet than the demands for precision are the demands sensor technology makes on robot guidance systems. If robots are ever to operate in factories more independently than at present, they will have to be able to process the information acquired by their feelers far better than at present.

It is not only the handymen among us who are far superior to robots in hand-eye coordination. Human intelligence is able to process data acquired from our various sensors many times better than a machine, and it is precisely this capability that is important for assembly operations in manufacturing. Furthermore, these data must also guide the sensors in turn. Although the robot head in the Dortmund institute "capably" follows objects moved about in its vicinity with its laser sensor, we are able to simultaneously turn our head, close our eyes, stretch out our hand and—consciously or unconsciously—concentrate on perceiving certain signals.

Probably the most difficult task for robotics is robot vision. How does the robot process the data delivered to it from a video camera? A seeing system must model its environment and fit the sensor's data into this model; to do this we humans use our lifelong experience with abilities we were born with—and yet we do not even know exactly how we do it. Thus far robot "vision" permits only primitive operations in no less primitive worlds reduced to a few elements. If an optically-capable robot is supposed to select a certain object from a group of other objects, we must present them to it all neatly lined up; a bargain table on the last day of the winter sale would drive the machine to despair—if it were capable of despair.

However, robot vision is making progress. This is due particularly to new computers which receive and process sensor information on several channels at the same time—an area of research known in computer science as "artificial intelligence." This also includes automatic diagnosis processes for robot systems being developed in the Dortmund institute. The plan is for them to work in space. "This area is particularly interesting for us because it's the most demanding," declares Freund self-confidently. His working group is designing robot guidance systems for the American unmanned space laboratory. Freund: "We take the view that humans should inspect the laboratory only once or twice a year for a week, but otherwise the robots should work autonomously. For that reason they must be tolerant to error, be able to take over the work of another robot if it breaks down, and not go crazy just because a test tube tips over." The computer racks for the model laboratory and control station are all ready on the first floor.

Robots under extreme conditions are of interest not only to space and underwater researchers but also to the military. Some generals dream of combat robots operating independently in an irradiated area. "I refuse to do

military research," Eckhard Freund stresses, "but of course I know that our research results can also serve military purposes." After all, a free-flying assembly operations robot can not only release the four jammed screws in the TV-SAT; it can also knock the solar panels off a Sputnik. The professor also responded helplessly to the question of whether this allegedly so interdisciplinary robot research also includes the social sciences; he would welcome that but lacks the time for such cooperation: "It may be that everything is going far too fast today but the Americans and the Japanese are working at high speed and we've got to compete. If it were not for the robots in Area 54, the VW Golf would cost DM61,000." A few kilometers from the institute there are 17,000 people working in Opel's factory in Bochum; the road robot research takes will also affect their work world.

Freund points out that scientific capabilities are guided by political and economic decisions—he is right about that. In a cost-intensive area of research like his, finances shape the freedom of research. It is not enough, then, for people only to talk about "shaping socially tolerable technology." When you talk to the scientist, he keeps coming back to money—and to his time budget, which includes far too much administrative work.

"The farther we go in robot research, the more problems we find," says Freund with pleasure. The official opening of his Dortmund institute building is in December.

FRG and Automation Established in Kassel

3698M016 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 483/484, 15 Jul 88 pp 15-16

[Text] The Comprehensive Technical University in Kassel has established an institute for metrology and automation engineering within its mechanical engineering department. More than 40 people work at the institute: in addition to Professor Hahn (automatic control engineering), Professor Holzapfel (metrology), Professor Johannsen (systems engineering/man-machine systems), and Professor Pressler (honorary professor of control engineering), the staff includes 18 scientists, five technical employees, and about 15 others working as scientific or student assistants.

The institute must provide even more qualified scientific training for future engineers in the field of metrology and automation engineering by coordinating resources, teaching subjects, and personnel.

However, the major task of the new institute is research. Its activities, even before it was officially established, are remarkable: within the framework of several major research projects, research is currently underway on extremely topical subjects in high technology sectors such as sensor and laser technology, robotics, and man-machine interaction. These studies are financed to a great extent by the BMFT [Federal Ministry for Research and Technology], the DFG [German Research Association], as well as by the European Community and several industrial companies. So far more than DM5 million have been allocated. The scientific achievements stemming from this research have been internationally recognized.

A significant share of the new institute's future research activities will fall under the heading of "Automation Technology in a Man-Machine System." The objective of these activities will be to investigate the possibilities and limits involved in automating complex man-machine systems. An example of a complex man-machine system that is clearly difficult to control is the traffic technology and safety technology aspects of the "driver/automobile/road system" — the large number of automobile accident on our roads is proof of this. The integration of intelligent sensor technology, electronic communications, and computer assistance within the automobile could relieve the driver, thereby increasing road safety, transport efficiency, and last but not least, reduce environmental pollution. The technical feasibility and the real advantages to the automation of driving are being assessed throughout Europe within the framework of the Prometheus project. Some aspects of this general area of research can and must be examined by the newly established institute at the Comprehensive Technical University in Kassel. The institute performs similar research activities in other sectors of metrology and automation engineering.

MARINE TECHNOLOGY

French Submarine Nautile To Research Polymetallic Nodules

36980069b Paris LE FIGARO in French 23 Nov 88 p 16

[Article by Jean-Paul Croiz: "French Scientists' Exploration Campaign in the Pacific: Secrets of Seabed Nodules." Passage in bold as published]

[Text] **For the first time, a team from the French Research Institute for Ocean Development (Ifremer) will dive with the submarine Nautile to a depth of 500 m, between Mexico and Hawaii, to assess the potential for polymetallic nodule mining.**

Until 25 December, Ifremer scientists will carry out an amazing mission of exploration 5,000 m [sic] under the sea, in the Pacific Ocean: as part of an operation called "Nixonaut," they will use the submarine Nautile to explore a huge field of polymetallic nodules, a concession granted to France last year under a UN agreement. This should prove a spectacular operation; until now, no one has ever gone on location to get a close look at these famous deposits, which may perhaps assure our mineral self-sufficiency during the next century.

Robots Only

Solidly tethered to its support ship, the Nadir, the Nautile just left San Diego, California. Destination: a large submarine field, some 75,000 km^2 in area, lying between Mexico and Hawaii; there, starting this week, Ifremer will complete 20 dives or so and draw up an extremely precise map of a world which man has never explored yet: the North Pacific zone where, under the international agreement on the Law of the Sea, France was awarded, one year ago, the title of "pioneer investor" which in fact grants her the right to mine the riches of the seabed. These, as is known, consist of millions of tons of precious minerals (chromium, zinc, manganese and titanium) which are contained in the famous polymetallic nodules, blackish concretions weighing a few tens to a few hundreds of grams, which were formed on certain seabeds during past eons.

"For the first time ever, three men on board a submarine will observe the landscape of one of these nodule fields, as you would observe a mountain landscape from an helicopter," Ifremer officials explained, adding that the mission will have a dual goal. It will be both scientific—improving our knowledge of the geological environment of such a deposit—and technical, making it possible to calibrate certain measurements made previously to develop the processes needed to gather the nodules—a manna which could acquire vital significance in the next century should surface mining resources become exhausted, as is feared.

The Nautile dives will undeniably have an adventurous side. Actually, until now only unmanned Ifremer robots—such as the Epaulard or the multibeam hydrolocator Seabeam—have surveyed these bumpy seabeds.

They brought back information on thousands of locations, photographs or interpretations of sonar echos, which scientists used to reconstruct the overall topography of the seabed. "But the existence of cliffs, depressions or channels at the bottom of valleys is perceived only through their acoustic relief," they pointed out. Therefore, the world that the Nautile is about to explore is still quite mysterious; only its shadows have been identified since people became interested in the deposits, in the 1970's: parallel ranges of hills, 200-300 m high and 3-5 km apart, steep cliffs, and depressions several hundreds of meters deep, where nodule-gathering equipment could get lost if its location were not perfectly identified...

Beyond pure exploration, one of the scientific objectives of the Nautile campaign will be to enable scientists to "handle" nodules for the first time on the very location where they were formed. The grips which equip the submarine, for instance, will make it possible to test accurately the nodule solidity at a depth of 5,000 m; until now, all the samples that could be examined on the surface had undergone dehydration and especially extreme "depressurization" (on the order of 500 atmospheres). Also, the divers will be in a position to test the friability of the ocean floor through repeated manipulations, and to make a refined analysis of the level of biological activity there, the better to define the ecological profile of the seabed, which is still not well known.

Technologically, finally, the Nixonaut campaign aims to better assess the validity of the gathering concept now contemplated. It would involve a battery of tracked vehicles criss-crossing the field granted to France; they would be powered electrically from the surface through flexible cables. These gathering vehicles would also be connected to a sort of giant vacuum-cleaner with a 5-km long hose through which the nodules would be sucked up to a surface processing unit.

Such vehicles will actually roam the Pacific seabed only, at best, by the end of this century. But, with the Nautile, Ifremer is starting to pave the road to the abyss through some material checks: for instance, when the submarine lands on the seabed, the researchers will simulate the pressure exerted by the caterpillar tracks that will propel the nodule-gathering robots so as to determine the weight for which they would start sinking into the sediments. Like a strange predator, the Nautile will also crush some nodules in its grips so as to measure the effort required to crush them on location (that would considerably simplify the gathering process). Finally, it will also try to get them off the ocean floor with powerful water jets; if this worked, it would also considerably simplify the gathering process, and without too much damage to the ocean floor.

Rauma-Repola Concentrating on Submersibles

36980073a Helsinki HELSINGIN SANOMAT in Finnish 23 Nov 88 p 29

[TEXT] In the beginning of the new year, Rauma-Repola will concentrate its metal industry units into a new development group. It will include those company units that are based on underwater technology and mechatronics, i.e., the development projects, Oceanics, Osel Group in England, and the mechatronics unit that includes Teopros and Locomec.

Drass S.p.A. which operates in Italy will become part of off-shore industry.

Sale of the Malmari & Winberg planning office with its seven employees to the managing director Antti Malmari is also part of the new arrangements.

As recently as a couple of years ago, Rauma-Repola hoped that the troubled shipyard industry could be gradually saved by the company divisions which specialize in underwater technology and are located mainly in Tampere. They believed at Repola that, among others, nodule pickers moving along the continental shelf could be quickly sold to the Soviets. Orders were believed to be coming in any time.

Confidence in the underwater technology disappeared as soon as Rauma-Repola found out that the Soviets do not have enough money to exploit the underwater resources. The price of a nodule picker is around a couple of billions.

Last year Rauma-Repola succeeded in selling to the Soviets two very deep-diving submarines.

A couple of years ago, Finland signed the American Cocom agreement on export limitations, which in part has caused the freeze in various Soviet projects according to Pekka Laxell, the director of the shipyard group at Rauma-Repola. The Cocom agreement forbids Finnish companies the eastern export of hi-tech products developed in Finland.

The Cocom regulations squeeze hard Repola's deep-sea technology and the integrated research systems developed by Hollming at Rauma.

According to Laxell, by concentration of its new metal industries, Repola aims at preserving the professional know-how in Finland. The development units will aid in the search for new products and new markets. Laxell reports that the economic yield of the topmost projects within the metal industry has been satisfactory until now.

The director of the underwater technology group, engineer Seppo Seppala, 38, will be appointed as the managing director of the new industrial group.

The director of the Oceanics-unit, engineer Simo Makkonen, 41, has been appointed as the director of the Rauma-Repola Development Projects. The director of Ocean Mining, engineer Pertti Pale, 47, will be the director of Oceanics, and engineer Olli Mikonheimo, 42, will direct Rauma-Repola Mechatronics.

MICROELECTRONICS

Dutch-Belgian ESPRIT Project Develops IC Design Software

36980061b Rotterdam NRC HANDELSBLAD in Dutch 19 Nov 88 p 19

[Article by Dick Wittenberg: "Philips Breakthrough in Designing of Chip"]

[Text] Eindhoven, 19 Nov—Researchers at Philips' Physics Laboratory in Eindhoven and the Interuniversity Microelectronics Center (IMEC) in Louvain, Belgium have developed a collection of computer programs that could mean a revolution in the designing of chips for telecommunications and consumer electronics.

Using this software package, which has been named Piramid (Precompetively Inspired Research on Advanced Methods for IC Design), the design time of chips can be shortened from months or years to hours or days. According to Dr Theo Claassen, director of Philips Research, this is of critical importance in order to quickly adapt to market demand and to technical developments.

The development of the automatic design system is a result of a research project within the framework of ESPRIT, the European research stimulation program. According to Claassen, Philips' involvement in that project was only on a small scale since the goal appeared to be much too "futuristic." "We still think that the system is futuristic, but in the meantime it is also become clear that it is also quite realistic," says Claassen.

Although there are already commercial software packages for designing chips, it is always the case that only part of the process is automated. Philips and IMEC claim that they are the first to design a system that can directly translate a system specification (what the chip has to be able to do) into a chip design. Previously designed components for the chips are used in the process.

Piramid enables the designer to test design alternatives in record time, while the option of automatically testing the chips is built in. "That makes Piramid a unique system," says Engel Roza, division head of Philips Research.

The software package is still just a prototype, but Dr Claassen expects that Piramid will find industrial applications within several years. In order to demonstrate the possibilities of the system, Philips is using Piramid to design a chip containing all the electronics of a compact disk player.

Philips, Siemens, SGS-Thomson in Eureka JESSI Project

36980069c Paris LE MONDE in French 29 Oct 88 pp 1, 26

[Article by Francoise Vaysse: "To Compete with American and Japanese Chips, Three Electronics Leaders Form a Partnership"]

[Text] On Friday 28 October, the three major European groups, Philips, Siemens and SGS-Thomson announced that they would pool their research on the electronic components of the future. This partnership, in the context of the Eureka program, should receive Fr20 billion in financing, from the companies as well as from the Dutch, German, French and Italian governments. What is at stake is to assure that, in 10 years from now, Europe will be at the highest technological level to compete with the Americans and the Japanese. Today, Europe produces only 10 percent of the chips used in the world.

It was not easy to arrive at an agreement: Siemens (Germany) was reluctant; it did not want to give an equal share to the French and the Italians. But now the agreement is signed. To try and catch up with the

Americans and the Japanese, the European companies Philips, Siemens and SGS-Thomson will pool their R&D efforts in the so-called "submicronic" technologies (submicronic because the line width of integrated circuit features will be less than 1 micron, actually 0.5 to 0.3 micron) that will be required to manufacture the memories and microproessors of the 1990's. Their cooperation will take place under a Eureka program called JESSI [Joint European Submicron Silicon Initiative]. In practice, this means that the three companies will cooperate to develop manufacturing processes for the next generation of integrated circuits. Within this program, each company will progress by developing its strong points: thus, Philips will work on SRAMs [static random-access memories], Siemens on DRAMs [dynamic random-access memories], and SGS-Thomson on EPROMs [erasable programmable read-only memories]. In a first stage (1991-1992), the manufacturers will focus their efforts on 0.5-micron manufacturing processes for integrated circuits with an average throughput of 16 megabits.

In the second stage (1995-1996), research will deal with 64-megabit circuits, 4 times as powerful and with still finer line widths: 0.3 micron.

The amounts involved are considerable: developing manufacturing processes will require expenditures of at least $400-500 million (Fr2.5- 3 billion) per year for 7 years, totaling over Fr20 billion. This is obviously the most extensive European program so far. These expenditures, the French partners assert, will be shared equally by the three partners whose agreement is subject to financial support from their respective governments. It remains to be seen to what extent they will be heard. "All the countries involved and Brussels as well are in favor of JESSI. But nothing has been finalized yet," people at Thomson said. Considering the strategic stakes of the project, it is obvious that manufacturers will receive some aid: if the European electronics industry is to survive, whether in the sector of consumer electronics (TV sets, hi-fi, etc.) or in that of business electronics (data processing, arms, telecommunications, etc.), governments cannot refuse to aid basic research on chips technology. As is known, European manufacturers control less than 10 percent of the world production of semiconductors; they must compete with the Americans (39 percent) and with the Japanese who, in recent years, have assumed a leading position (48 percent). Also, European manufacturers seldom achieve the highest technological level.

By pooling their resources, Philips (1987 sales: $1.6 billion), Siemens ($657 million) and SGS-Thomson ($860 million), will just barely manage to reach the level of the leading groups worldwide: the Japanese NEC ($3.2 billion) and Toshiba ($3 billion). Cooperating is therefore the only way for them to achieve the sales, and acquire the capabilities required to carry out such a research and development effort. But, first, they will have to overcome Siemens's reluctance: last April, the French and the Italians were upset by some statements of the giant from Bavaria, which gave to understand that Siemens and Philips would have to be project leaders. Fearing they would get no more than a back seat, the French and Italians pleaded for a "balanced" work distribution (LE MONDE, 6 April 1988). Now, the French-Italian pair at the head of SGS- Thomson (a 50-50 partnership between Thomson and the Italian SGS) is satisfied with the task allocation provided under the agreement. "We will cooperate to develop manufacturing processes, not future products. After that, each party will recover its freedom," people at Thomson explained.

This pooling of European resources had become a necessity. The Japanese are going ahead full steam (the three world leaders are now Japanese companies), and last year, in a complete reversal of their usual policy of cut-throat competition, U.S. companies decided that they, too, would pool their resources. They created a joint research organization, Sematech, with the blessing of antitrust authorities in Washington and, of course, the Pentagon. Indispensable union of forces: the sound operation of the JESSI project, harmonious relations among governments and businesses, these too will be a test for the Europe of 1993.

Philips, Siemens, SGS-Thomson Cooperation Within JESSI

36980053a Paris LE MONDE in French
29 Oct 88 pp 25-26

[Article by Francoise Vaysse: "Three Electronics Leaders Form a Partnership"]

[Text] Philips, Siemens and SGS-Thomson will pool their resources to carry out research on the electronic components of the 1990's; the research project [JESSI, i.e., Joint European Submicron Silicon Initiative] is part of the Eureka program and will require Fr20 billion over 7 years.

In the second stage (1995-1996), research will deal with 64-megabit circuits, 4 times as powerful and with line widths still finer: 0.3 micron.

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Philips, Siemens Call Megaproject Success, Form Profit Strategies

36980055 Rotterdam NRC HANDELSBLAD in Dutch 5 Nov 88 p 21

[Article by Dick Wittenberg: "Philips and Siemens Superchips Approach Production Stage"; first paragraph is introduction]

[Excerpts] Four years ago, Philips and Siemens began the Megaproject, a daring and costly race to catch up in the area of chips. Now, the project is coming to an end, and the plan appears to have been a smashing success. But will Philips and Siemens ever get back their billions in investments? "We still have a very long way to go before we are competitive," says Dr Hans Friedrich, head of the Megaproject for the German multinational.

Eindhoven/Munich, 5 Nov 88—Perhaps one should take the statements by Dr Theo Holtwijk with a grain of salt. Holtwijk clearly compensates for his lack of modesty with a sense of bravado. But if you do believe Theo Holtwijk, the Dutch and German governments have rarely spent the taxpayers' money so well as when they decided 4 years ago to contribute 500 million guilders to the technological development of a new generation of chips.

Theo Holtwijk is a strategic planner with the Components Division of Philips. Within the company, he is considered one of the people most familiar with the Megaproject, as Philips and Siemens call their cooperative venture in the area of chips. While mass production of the new generation of chips still lies ahead, he does not hesitate for one moment to call the project "a success already." "Naturally," Holtwijk says. "Ultimately, we have taken a tremendous step forward in terms of technology. We worked together with Siemens in a tremendous fashion." And then emphatically: "Something major has been achieved here."

B. Palmer, a market analyst for Dataquest in London, uses less grand words. Still, he essentially says the same thing: "Three years ago, Philips and Siemens were 2 to 5 years behind in technology. Now that lag is probably less than 1 year. It is a tremendous achievement for Philips and Siemens."

Clock

They needed it too. During the early 1980s, the two electronics companies had watched enviously as Europe's share of the chip market continued to decline. Fearfully, they were forced to accept the fact that Japanese companies were dominating an ever-growing share of the world market while their technological lead was getting bigger. Both Eindhoven and Munich recognized the dangers all too well. [passage omitted]

For Philips and Siemens, it was not only their position as chip producers that was on the line—the future of the entire company was at stake. If they wanted to survive, then there was no alternative to joining the rat race in chips, even if the costs were exorbitant.

In order to share the billions of guilders in expenses, Philips and Siemens decided at the end of 1983 to form an unholy alliance. [passage omitted]

Now that the project is coming to an end, Dr Hans Friedrich, head of the Megaproject at Siemens, can say with peace of mind, "We have achieved our goal." Right on schedule, Siemens offered the first test samples to customers in June. Philips too has shown its first samples to future users.

Large Quantities

But having the technology at one's disposal is still not enough to be able to manufacture the chips on a mass scale, to say nothing of selling them at a profit. "We still have a very long way to go," acknowledges Friedrich. "We still have to manage to get the production process under control to such an extent that we are able to make memory chips in large quantities, with a high level of quality and without many rejects. It is still possible for much to go wrong."

In getting a grip on the production process, Siemens does have one important advantage over Philips, Friedrich feels: Siemens already makes dynamic memory chips. At the same time 5 years ago that the German company decided in favor of the Megaproject, it bought from Japan's Toshiba the production technology for the 1 megabit DRAM, the predecessor generation to submicron chips. At the time, that act was practically termed treason by the German press, but since then Siemens has reaped the fruit of its action.

This year, the company expects to be able to supply 3.5 million 1 megabit memory chips at a price that has risen to $60 a piece, due to acute scarcity. Next year, production will rise to 20 million. "We are starting now to get a feel for the process," says Friedrich. "In terms of know-how, we can build further on the production of submicron chips."

At the outset of the Megaproject, Philips and Siemens assumed that by the end of 1988 there would be a mass market for the 4 megabit DRAM and 6 months later one for the 1 megabit SRAM. This expectation was based on explosive growth in the market in 1983 and on the set rule that a new generation of chips emerges every 3 years. Since then, however, growth in the market has been much slower than was expected amidst the euphoria of 5 years ago. Moreover, it appears that the period of time needed by a new generation of chips to capture a substantial share of the market is gradually becoming longer.

Mass Market

The result is that large-scale demand for Philips' 1 megabit SRAM and Siemens' 4 megabit DRAM will not emerge until the early 1990s. Friedrich thinks that that is just fine. Until then, Siemens can simply continue with the lucrative manufacture of the current generation of memory chips. "Technologically and economically sensible," says Friedrich. At the same time, Siemens will be begin production of the submicron chips next year on a modest scale. "To be ready once the market is ripe."

Philips is in a less luxurious position. However, Mr Rob Hamersma, head of the Megaproject at Philips, disagrees. He says that next year Philips, in expectation of the emergence of a mass market for the 1 megabit SRAM, will begin production of the current generation of 256 K SRAMs using submicron technology. According to Hamersma, the financial returns form this will not lag behind original plans. He emphatically denies reports that more sluggish market trends are resulting in higher initial losses for Philips.

Market researcher Palmer of Dataquest calls the move to 256 K chips "logical and sensible." "The market for 256 K chips is growing, and currently remains entirely in the hands of Japanese companies."

Still, the question remains of whether Philips and Siemens will get back the approximately four billion guilders—1.5 billion for the Megaproject, 2.5 billion for new factories—that they have invested in the submicron chip. To a considerable extent, that depends on the effectiveness of their strategy of also using submicron technology for chips other than memory chips.

For purely practical reasons, the Megaproject was primarily oriented towards memory chips; because of their regular structure, memory chips are the easiest to make. Moreover, there is a mass market for memory chips, which means that manufacturers can quickly move into mass production. In the chip sector, this is the only way to rapidly get the production process under control.

But actually, Philips and Siemens are primarily interested in the manufacture of special chips, for telecommunications or for consumer electronics, for example. This is where their strength lies; it is through these applications that they have the best chance of making money. Thus, memory chips serve primarily as trailblazers for submicron technology, which will subsequently be used into the mid-1990s for the manufacture of thousands of other types of chips. At the same time, memory chips themselves are also economically important; with their large numbers, they must by necessity constitute the foundation of a factory's output.

In the search for the right balance between memory and other chips, Philips and Siemens have taken different routes. Ultimately, Philips has decided on static memory, Siemens on dynamic memory. The advantage of dynamic memory, says Friedrich, is that the market is much larger and the startup period achieves a critical level much faster. "All major companies use dynamic memory as a technological locomotive."

The advantage of static memory, says Holtwijk, is that its specific properties lend themselves to a broad range of applications. "We are developing a memory portfolio. We are not monomaniacally focused on one little market." Holtwijk sees an additional advantage in the fact that the technology of static memory is more related to that of special chips than is dynamic memory.

It is impossible to predict which choice is the best one, Friedrich feels. "That is almost a philosophical question. We have both made a choice, and we will both have to stick to them."

Just as Philips and Siemens will also have to continue raising the competitiveness of the European chip industry, Friedrich thinks. "Because in that regard we are far from catching up with Japanese manufacturers. The Megaproject was a first step. Mega gave us the technological basis. But we in Europe will also have to develop our own industry capable of manufacturing production equipment for the chips. And a great deal of work is still needed in order to convert chip technology into successful European applications."

Philips, Siemens and the French-Italian group SGS-Thomson are hard at work formulating a European research program, JESSI (Joint European Submicron Silicon), which is intended to fill in this gap. Estimated cost: six to eight billion guilders. According to Friedrich, this spending must be regarded "as investment in the future of Europe and of European industry."

Friedrich says that right now, European industry is unable to finance the tremendous development costs from the sale of chips. "However, that cannot go on forever, there I agree with you."

In the meantime, he views it as "nothing short of obvious" that the governments should contribute financially. Just as the governments of Japan and the United States support their national industry. "We made excellent use of the subsidies for the Megaproject."

MBB Develops Laser Soldering Process for Chip Production

36980040b Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 7 Oct 88 p 8

[Text] Frankfurt—The increase in packing density, complexity and miniaturization in microelectronics technology has led to new techniques for surface-mounting electric and electronic components. To this end, Messerschmidt-Boelkow-Blohm GmbH [MBB] in Ottobrunn has created the temperature-controlled laser micro-soldering process. It is intended to make possible rapid positioning, efficient automation and contact-free— i.e., very careful and rapid—soldering.

Among the choice of lasers, the carbon dioxide and neodymium YAG laser, which is in use by and available to industry, is basically given preference. The Nd-YAG laser is better suited for the low-temperature range, and is more compact than the carbon dioxide laser. Beam control with optical fibers is flexible and easy. The Nd-YAG laser light is better absorbed by metals and can be focused with greater precision. Relative temperature measurement is possible with a rapid infrared detector that responds in the millisecond range; the sensitivity of this detector is adjusted to the soft solder temperature and cannot be disrupted by reflected laser irradiation, meaning that it has an appropriate filter. A standard adjustable infrared detector/temperature control is used for the upper temperature limit.

The IR detector signal is processed by a desk computer. As soon as the surge-like change in the temperature gradient is signaled or the T/t limit is achieved, the laser beam switches to a new soldering joint. The various soldering joints are triggered by way of an x-y table, a robot unit or a scanning device based on the circuit design. Robot control is preferred, since it can be effected in six axes and it permits easy adjustment of the laser beam using beam waveguides. By alternating robot grippers, it is easy to integrate the laser soldering unit in the processing line with insertion, pasting, preheating and cleaning. Electrically driven parallel grippers make it possible to have simultaneous, parallel soldering steps.

Through the software for the laser soldering unit, one can: automatically adjust and calibrate the device; conduct automated production with process control/protocol; acquire information about the device, process, service instructions and assistance in the event of breakdown; examine the laser, positioning and process parameters in single-solder tests. It is possible to keep a file on adjusted values for certain serial solders in various mountings, whereby the number of solders, forward feed, laser output or soldering temperature and time can vary; control and breakdown data are also available.

Using this type of device, chips can be perfectly soldered to connections in the one-tenth of a second range. Shorter soldering times are possible, but the reaction and dissolution of the liquid, plus melting, running, dampening and alloying require times of one one- hundredth to one-tenth of a second. The advantages of laser micro-soldering are the precisely specified, very small heat-influence levels, which are limited to contact points. Contact-free bonding means not only thermally, but also mechanically meticulous soldering. Because of this, higher-melting solders with higher continuous creep strength and heat resistance and strength can be used on synthetic printed circuit boards.

Using fiber optical waveguides, the laser beam is easy to control, divide and precisely measure in terms of angular position, pulse time, lumination, spot size and positioning. This is the source of the automation potential and the reproducibility of the laser micro- soldering unit. Work on the laser micro-soldering device is continuing in a joint project by the Fraunhofer Institute for Laser Technology in Aachen and the MBB Automation Department.

FRG's AEG, Telefunken Develop Monolithic MM Wave Integrated Circuit

36980057 Milan ELETTRONICA OGGI in Italian Jun 88 pp 57-60

[Article by H. Friedberg: "Monolithic Millimeter Wave Circuits"]

[Excerpt]

Technical Achievement

Practical use of new frequency bands has always begun when both the transmitter and receiver have become scientifically producible. This is particularly true for radio applications at millimeter wavelengths, in that large-scale use of radio or radar equipment for short distances requires prices that are within reach of all potential users.

For transmission at mm wavelengths, a topic not addressed in this article, AEG produces IMPATT silicon diodes with a CW power output of 1 W and a pulsed power output of 50 W at 94 GHz, and in this regard occupies an out-front position worldwide. It is planned to mass-produce these components in coming years.

The company, which since 1970 has been active in the development of mm-wave technology, quickly realized that waveguides involving the high degree of precision required at these wavelengths could not be mass-produced in small numbers at low cost . It therefore proceeded, from 1975 onward, to develop the technology of FIN conductors, in which the waveguide serves only as shielding. The electromagnetic waves are carried by a thin-film circuit, in which the high degree of precision referred to above is easily attained using the lithographic etching technique. In thin-film circuits (17 microns of Cu and 2-3 microns of Au on glass-fiber-reinforced teflon, or 3-5 microns of Au on a quartz substrate), the mixer or switcher diodes can be soldered, cemented or connected. AEG is a leader in the technology of FIN conductors at frequencies of up to 150 GHz.

Even FIN conductor technology, however, involves particularities requiring the use of cost-reducing production techniques such as: The construction of the thin-film circuit inside the waveguide, which, although admitting of large tolerances, must nevertheless be done on NC [numerically-controlled] machines, using the fixed-cutter technique; the precision mounting of the semiconductor on the thin-film circuit; and the final adjustment operation. To overcome these limitations, AEG, 3 years ago, undertook the development of an integrated circuit for millimeter waves at frequencies between 3 and 30 GHz, designated the M^3IC [Monolithic Millimeter-Wave Integrated Circuit], serially to the MMIC [Monolithic Microwave Integrated Circuit]. The company is working with Si and GaAs, and the keystone of the receiver is GaAs. The reasons for this choice are the high resistance of the undoped materials (10^7 Ohms/cm), improved mixer-diode properties, and amenability to integration of thin-film amplifiers with MESFETs, and in the future with preamplifiers using HEMT [high-electron-mobility transistor] technology, all on the same chip. The company's High Frequency Department, which is using CAD programming to develop the circuit design rules—in cooperation with Telefunken Electronic, which has designed a new layering method (by means of which Schottky mixer diodes and MESFETs can both be produced) and will be in charge of production—completed, in June 1987, the first totally successful GaAs 35-GHz monolithic receiver. Unequalled elsewhere in the world, the MEC 35 contains, within a volume of 6 X 5 mm^2, a hybrid ring that feeds the received signal and the oscillator signal, in push-pull, to both Schottky mixer diodes. A low-pass filter feeds the intermediate-frequency signal to the first IF amplifier stage, whose output can be fed to another integrated circuit (amplifier, second mixer). The published characteristics of the MEC 35 are:

— Receive frequency range 33-37 GHz,
— Conversion loss 7.2 dB,
— Background noise 6.5 dB
— Intermediate frequency 0.5-1.5 GHz,
— Amplification 10 dB.

Further development is aimed at extending the frequency range to 100 GHz. In addition, the receiver's oscillator will have to be integrated, and later put on the same chip with the receiver.

Technology for Millimeter Wave IC's

Receivers for frequencies as high as 100 GHz will have to be based on GaAs, which has six times the carrier mobility of Si. Hence, GaAs, unlike Si, can be produced as a semi-insulator, so that resistors, capacitors and inductances—in addition to MESFET- and HEMT-type fast Schottky diodes—can be ideally integrated with power strips. To do this, Telefunken Electronic uses a combination of selective implantation and epitaxy to integrate differently doped layers on a single semi-insulator layer.

Highly-doped n^+layers for diodes are produced by implantation followed by fast healing, while very-slightly-doped n^- layers for Schottky diodes and MESFETs are produced by metallo-organic epitaxy (MOCVD [metallo-organic chemical vapor deposition]), at but around 630 degrees C. Insulation of the active elements is obtained by implantation of boron in the epitaxial layers.

In the MEC 35, the diodes have a contact area of 30 $microns^2$. The IF amplifier, tailored for the 0.5-1.5 GHz range, has a 4-fingered air-bridge-technology type MESFET with a gate length of 1 micron and a gate width of 1 mm. The input and feedback coupling grid and the fixed capacitor, placed at the input and output, complete the element.

Work is currently proceeding in the frequency band around 60 GHz, and will later move into the band around 90 GHz. The submicron technique involved requires the use of direct electron-beam lithography. Telefunken Electronic has set up a pilot production line to machine components of 50-mm and 75-mm thicknesses. In forthcoming years, it plans to expand this plant to produce a larger number of parts.

NUCLEAR ENGINEERING

French, USSR, FRG Physicists Discover New Atomic Nucleus

36980069a Paris LE FIGARO in French
23 Nov 88 p 16

[Article by Jean-Luc Nothias: "A Discovery of CNRS [National Center for Scientific Research] Physicists; The Surprises of the Elusive Nucleus"]

[Text] **Thanks to its large heavy ion accelerator, a French team working together with FRG and USSR scientists has discovered an atomic nucleus that was not believed to exist.**

Nuclear physics still has many surprises in store. Experimental results take a malicious pleasure in contradicting theoretical models. Thus, a delicate microdissection of atomic nuclei, performed by a French team with the help of German and Soviet scientists, has shown that, in addition to many nuclei predicted by theory, it contained a nucleus they had thought could not exist. Nuclei thumbing their noses at the scientist's gray matter? Although not revolutionary, this discovery will lead to improved models of nuclear particle assemblies.

Valley of Stability

What is, then, this elusive nucleus? "It is an isotope of fluorine, with 9 protons and 20 neutrons," Dominique Guillemaud-Mueller, CNRS researcher at the Orsay Nuclear Physics Institute and "reporter" of the research group, explained. "Normal fluorine has 9 protons and 10 neutrons. According to theory, 29F could not exist in the bonded state. It has a short lifetime, but the demonstration of its existence will enable us to refine theoretical prediction models." Complex as they may be, physicists' equations are still not precise enough to account for the different states of matter. Especially such short-lived and elusive matter.

Actually, the scientists who made this discovery are pioneers in the field of nuclear cohesion. They are interested in the unstable, nuclei that will not stay put and keep changing states. As is known, nuclei are made of two kinds of particles called nucleons. First, the protons which carry a positive electric charge. They are subject to an electromagnetic force which tends to push them apart since they carry the same charge (on the other hand, it will attract the electrons which gravitate around the protons). Second, the neutrons which, as their name indicates, do not carry an electric charge. They are subject to a strong nuclear interaction which pulls them together. The electromagnetic force is not as strong as that second force, but it has a greater range.

The atomic nucleus, containing both protons and neutrons, is therefore a "trade-off" between forces of repulsion and forces of attraction; the latter must be just a bit stronger than the former. Only certain combinations of nucleons (there are 6,000 of them) will fulfill this condition, and this accounts for the fact that there are only about 300 stable nuclei.

The others, located on the slopes of the "valley of stability," tend to fall, to roll down to the lowest point. These "marginal" combinations include the unstable nuclei called isotopes. Some are found in nature; they generate natural radioactivity. Others are extremely rare or even non-existent, so short is their lifetime.

Physicists, therefore, explore the valley of stability of atomic nuclei by dissecting their elements. What will happen if I add a neutron? Adding is a rather weak word to express all that is involved. To fragment the target atoms, they are bombarded with heavy ions in a particle accelerator, in this case the Ganil accelerator (Large National Heavy Ion Accelerator). The physicists' reasoning is simple: if we start with a neutron-rich target, chances are that its fragments, too, will contain more neutrons than the average.

The most interesting atom in this respect is a rare calcium isotope, 48Ca (20 protons and 28 neutrons). It accounts for only 0.18 percent of all calcium isotopes. If it is rare it is expensive. Hence the collaboration with the Dubna nuclear reaction laboratory, in the Soviet Union. As a result, Prof Youri Penionzhkevich arranged for a calcium preparation to be enriched until it contained 70 percent of 48Ca.

Primitive Reactions

With this ideal target, the French were able to complete their experiments. Close to 15 nuclei that had been predicted but never observed were created. They included 29F which theory said could not exist. But there were others besides that. In particular, 44S, a sulfur isotope, caught the researchers' attention. Its presence was not surprising. The surprise was that there was so much of it. This will have important repercussions in astrophysics and might help understand how the universe originated.

Actually, physicists are trying to reconstruct the nucleosynthesis mechanism, i.e. what happened to primeval elements after the Big Bang, and how nuclei and atoms were formed through association and decay. Many paths can explain the formation of all the atoms which now fill the universe and the Earth. But these paths cross one another, and these crossroads as as many compulsory checkpoints.

Identifying them amounts to gaining a more intimate knowledge of matter and discovering the primeval reactions that formed our world. These results confirm that large particle accelerators are tools which have not yet delivered all their potential. And that matter still has secrets for us.

SCIENCE & TECHNOLOGY POLICY

EC Commission Assesses European S&T

3698A032 Brussels EC INFORMATION MEMO in English No P-131, 15 Nov 88 pp 1-2

[Report entitled: "The State of Science and Technology in Europe"]

[Text] Despite substantial progress in recent years, Europe remains weak in a number of the science-based sectors which are growing rapidly worldwide. This economic weakness reflects a technological dependence in key areas, says the first report on the state of science and technology in Europe, that the Commission has just adopted.

The main aim of the report is to provide a factual basis for further reflection on Europe's needs in science and technology and how best they can be satisfied. It does not, however, attempt to identify at what level or in which framework at national or at transnational level action in specific fields could most beneficially be taken.

The Commission intends to update the report during 1989. Thereafter it should be published at two-yearly intervals.

A good deal has already been done to improve the European situation by increased efforts in spending on research and development and in improving industrial performance through innovation. But the efforts are still unbalanced and fragmented. Three member states—Germany, France and the United Kingdom—account for three-quarters of total spending on research and development in the Community; and regional variations are acute. Cooperative transnational actions (Community programmes, EUREKA, COST, ESA, CERN, etc.) account for only a small percentage of the total research effort.

European efforts are in fact well below those of our major competitors—the USA and Japan—who are both spending more and also taking action to remedy their own weaknesses. Europe's position is also threatened by the new efforts of emerging science and technology powers—the Newly Industrialized Countries (NICs) in particular.

Europe faces three main challenges: to increase its capacity to develop and pursue, where necessary, its own technological and economic options; to strengthen its international comptetiveness, especially in those fields which will take on increasing importance in the future; and to meet the social need for improved quality of life.

Europe has the resources to meet these challenges. It is rich in scientific talent and organisational ability. And in its present economic situation it can easily afford to invest in R&D. The question is how to get the best out of these resources and in which areas to focus the effort.

Getting the best out of European efforts entails addressing a series of issues: ensuring that science and technology are understood and accepted at all levels of European society; overcoming imbalance and fragmentation by better coordination and by ensuring an adequate basis for technological progress in the less favoured countries and regions; encouraging the spread of technology skills throughout society; attracting more private-sector finance and facilitating the diffusion of technology throughout industry, encouraging the links between industry and universities; as well exploiting the scope for international collaboration in those areas where there are evident mutual benefits.

As far as research areas are concerned, the report highlights five areas of major relevance to the European economy:

- Information technology and telecommunications—a particular effort is needed to improve the situation of the European semiconductor industry;
- New materials and technologies for use in manufacturing industry—superconducting materials are particularly promising;
- Aeronautics, where Europe faces a particular competitive challenge;
- Biology and biotechnology, which offer the prospect of major transformations in industry and agriculture as well as in the medical field. Specific efforts, however, are needed on basic plant biology, gene-mapping, neurobiology and biotechnology applications;
- Energy, where Europe remains highly dependent on outside sources of supply—fusion is important for the longer-term and carefully targeted research on new and renewables and energy-saving technologies in the shorter-term.

In terms of the quality of life, there are major research needs in the fields of environment, health research, and industrial, road and nuclear safety. In environment some of the research requirements have a global dimension. Europe has the capacity as well as the need to make a major contribution to the study of global climate change.

Underpinning these efforts in specific fields, Europe must sustain and develop its capacity in basic research to provide the seedcorn for new technological openings.

EC Council Adopts Three Research Programs

3698A036 Brussels EC PRESS RELEASE in English No IP(88) 713, 18 Nov 88 pp 1-4

[Report: "Three New Specific Research Programmes Adopted by the Council"]

[Excerpts] The Council of Ministers reached on 17 November a common position on three new specific research programmes. These are:

Research in the Economic Sciences (SPES)

Community activities to stimulate the international cooperation and interchange needed by European research scientists have so far been concerned only with the exact and natural sciences. But since economic science also addresses itself to the fundamental objectives of the Community, and can contribute to a better formulation of Community policies, there is a growing interest in establishing a network of cooperation and interchange between economists of the highest professional quality at the Community level. [passage omitted]

Use of Large Scientific Installations

Throughout the Community, there are a significant number of large-scale scientific and technical installations, many of which are not used to their full potential, and some of which duplicate those available elsewhere in Europe. These installations include highly specialised machines and equipment such as particle accelerators, synchrotrons, neutron sources, oceanographic vessels, primate centres and radio-astronomy equipment. The list is not exhaustive.

This apparent surplus capacity of these installations is due mainly to the absence of a European "community of users" and the fact that the facilities themselves are often insufficiently specialised and complementary.

By giving scientists in each member state easier access to facilities in other parts of the Community, it should be possible to increase the workload and economic efficiency of these installations. This would involve the training of a greater number of users and giving scientists in some member states access to experimental facilities that simply do not exist in their own countries.

The new programme will supplement and strengthen these measures by providing support to improve and upgrade existing large-scale installations. Under this programme, any organisation with a large-scale scientific facility may ask the Commission for financial support for between one and five years. The Community contribution may be used to upgrade the equipment, make it more specialised or to adapt existing equipment to allow a specific project to take place.

In return, the use of the facility must be fully opened up to all member states. Community support will facilitate access to these experimental centres for research teams that have little chance of using them at the present time. These opportunities will therefore be particularly valuable to researchers from countries having few facilities and from small and medium-sized firms.

Priority will be given to researchers from European countries other than that in which the facility or installation is situated. Proposals for experiments made by European scientists interested in the opportunities made available would be examined by a scientific selection panel and the beneficiaries would be responsible for ensuring that the Community's interest was borne in mind.

The Commission will also specify the obligations of the beneficiaries, particularly those relating to methods for the protection, dissemination and exploitation of research results.

The Commission is requesting a budget of ECU 30 million for this programme, to cover the period 1988-1992.

ECLAIR: New Agro-Industrial Research Programme

The new five-year programme of agro-industrial R&D which will exploit the most recent developments in biotechnology (ECLAIR) aims to give a technological boost to the competitiveness of those industries which interact with agriculture.

This shall be achieved through precompetitive research and technical development projects and coordination activities, based on close collaboration between agriculture and industrial activities, and supported by training-/mobility grants. Funding from the Community budget will amount to a total of ECU 80 million for the period 1988-1993.

The principal objectives of this program are:

- Research, adaptation and development of agricultural products destined for industrial use, as well as the research and promotion of new industrial techniques for processing and transforming agricultural raw materials with a view to obtaining, under economically viable conditions, industrial products which respond to the needs of the market;
- Research and development of industrial inputs in agriculture, such as pesticides, fertilizers and of eradication and disease control systems less harmful or better adapted to the environment; the reduction and elimination of by-products of processing by recovering resources and reducing waste.

Programme Content:

1. Evaluation trials and production of new species or organisms;
2. Industrial products and services (agricultural inputs and outputs);
3. Integrated approaches to industrial and agricultural systems.

The programme is aimed at improving the interfaces of agriculture and industry, by taking advantage of Europe's strength in biotechnology and the life sciences. Though not supporting the development of marketable products or processes, the programme will support research for clear-cut agricultural and/or industrial applications or objectives.

ECLAIR will thus promote collaborative field trials and development projects, bringing closer to practical application some of the existing research results and technological capabilities which have a potentially high economic impact. Its aim is to examine new ways of generating long-term growth in Europe by creating a new partnership between agriculture and industry based on the latest scientific advances. It will seek new outlets for the products of the land, using the new technologies to add value and to create materials better adapted to meet the needs of a wider range of market-driven industries.

The programme will be implemented by cost-shared and, in the case of universities and research institutions, by marginal-cost contracts. For cost-shared contracts the Community's contribution will normally not exceed 50 percent, the remainder to be provided by the partners, predominantly cost-contracts; however, the Community may bear up to 100 percent of the additional expenditure involved.

EC-Sweden Joint Research Committee Meets

3698A033 Brussels EC PRESS RELEASE in English No IP(88) 720, 18 Nov 88 p 1

[Report: "Meeting of the Joint Research Committee Sweden-European Communities in Brussels"]

[Text] Cooperation in science and technology between Sweden and the European Communities is becoming more and more effective. This was the conclusion of the Joint Research Committee Sweden-European Communities at its third meeting held in Brussels on 10 November 1988.

The meeting was chaired by Dr. Giuseppe Valentini, director in charge of scientific and technical cooperation with third countries at the Directorate General for Science, Research and Development of the Commission of the European Communities. The head of the Swedish delegation was Mr. Ulf Dinkelspiel, ambassador.

During the meeting the Joint Committee reviewed recent developements in the policies of Sweden and the Community with regard to science and technology as well as the priorities set by both parties.

Then the Joint Committee examined in detail the progress achieved in the concrete implementation of cooperation in fields covered by Community programmes. Two cooperative agreements on R&D in the fields of wood as a renewable raw material and recycling and utilisation of waste were approved by the Council of the European Communities on 26 September 1988 and will enter into force shortly. Two other cooperative agreements in the fields covered by the Community programmes on medical and health research and on the plan to stimulate the international cooperation and the interchange needed by European research scientists (SCIENCE) are in the final stages of negotiations. In addition, several research projects with Swedish participation are being or will be implemented in the framework of the Community programmes EURAM (advanced materials), BRITE (industrial technologies), RACE (advanced telecommunications), ESPRIT (information technologies) and DRIVE (road infrastucture for vehicle safety).

The Joint Research Committee also discussed the possibility of the expansion, during the months to come, of cooperative research activities in the field of environmental protection, applied metrology, AIM (Advanced Informatics in Medicine), SPES (economic science), FLAIR (food-linked agro-industry), JOULE (long-term energy supply), predictive medicine, biotechnology, research in the field of aeronautics, and science and technology for development.

Both delegations signalled their determination to further reinforce mutual relations in the fields of science and technology.

EC Report Identifies Areas of Needed Research Concentration

36980078d Paris AFP SCIENCES in French 17 Nov 88 p 5

[Text] Brussels—The EEC continues to be "weak" and "dependent" in numerous sectors of science and latest technologies, despite the substantial progress during the past few years, according to a report requested and approved on 15 November by the European Community in Brussels.

The Community shows a particularly disturbing lag in information technologies (design of software, production of electronic components, etc), a Commission spokesman told AFP in commenting on the report. On the other hand, the Community is in a rather advantageous position with respect to the new technologies applied to the traditional industries (textiles, automobiles).

The report lists five fields in which European industry should concentrate its research efforts:

— Technologies of information and telecommunications (semiconductors industry),
— Use of new materials and technologies, such as superconductivity, in manufacturing industry,
— Aeronautics, in which the positions recently achieved by European industry are threatened by the huge technological effort undertaken by the United States to maintain its dominant position,
— The biology and biotechnologies (in particular genetic manipulation and neurobiology), for which there are many applications in industry, agriculture and medicine,
— Energy, for which Europe remains substantially dependent on its foreign suppliers.

In face of the competition of Japan, the United States and the newly industrialized countries of Asia and Latin America (South Korea, Taiwan, Brazil, and, to a lesser extent, India, Hong Kong, Singapore and Argentina), the EEC is still suffering from glaring internal imbalances, the report warns. Thus, the FRG, France and the United Kingdom alone account for three-quarters of the total research and development expenditure of the Community.

European cooperation, whether through EEC programs or other projects (EUREKA, ESA, CERN, etc), still represents "only a small percentage" of the total sum for research effort, according to the report submitted to the 17 European commission members.

EC Resolution on Joint Research Center Detailed

Editorial on Industry Cooperation

3698A015 Brussels IRDAC NEWS in English Sep 88 p 1

[Text] The Council of Research Ministers decided on 29 June 1988 on the path that the JRC [Joint Research Center] should follow in the future. Together with the approval of legal texts for JRC specific programmes, the Council adopted a resolution which outlines the essential elements of the reform of the Centre; the European Parliament, on 13 September 1988, endorsed the Council's decision. This terminates a long process initiated when the Commission asked for the views of a panel of senior industrialists on the work of the JRC. The Chairman of IRDAC, Dr. Beckers, and two of its current members, Prof. Danielmeyer and Mr. Y. Farge, took an active part in the work of this panel. Its conclusions largely inspired the Commission's proposal and the decisions which have now been taken.

The Joint Research Center now has to translate the new guidelines which have been assigned to it into concrete terms. One such guideline is to ensure closer contacts with the industrial world. This implies an increased consultation with the end users in industry for correctly orienting those parts of the JRC programmes which are of special industrial relevance; IRDAC and its working parties should play a role in this respect. This also implies that the JRC is actively seeking to perform scientific and technical work under contract from industry. Several forms of intervention are being considered: collaboration contracts where the financial burden of the work performed is shared between the third party and the JRC (in this case, the subject of the work has a strong relevance to JRC-specific R&D programmes); contracts fully financed by the third party for research work or scientific-technical service work (such as the use of JRC research facilities), where the results belong fully to the contractor; joint proposals by industrial entities and the JRC for Community shared-cost actions; joint participation in Eureka projects; the setting up of industrial clubs on specific subjects where the JRC has a particular competence to offer. All these new avenues are being actively followed and the expertise that the JRC can make available to industry will be clearly presented. The Joint Research Center welcomes, in this respect, the offer made by IRDAC in its opinion of 18 March 1988 to contribute towards making the JRC better known in industrial circles.

Excerpt From Resolution

3698A015 Brussels IRDAC NEWS in English Sep 88 p 1

[Text] The Coucil of the European Communities:

...*Reaffirmed* the Community character of the Joint Research Center (JRC) and considered it vital for the JRC's future success that it should attain internationally acknowledged scientific excellence and become more competitive, in order to play as full a part as possible in achieving the Community's aim of strengthening the scientific and technological basis of European industry, encouraging it to become more competitive and urging the Commission to take all necessary measures to achieve this end;

...*Considered* that, with a view to contributing to the objective of the economic and social cohesion of the Community, the JRC should also develop practical and significant initiatives to reinforce collaboration with the research centers and laboratories of all member states, thereby assuming the role of catalyst of European scientific integration;

...*Urged* the Commission to introduce all necessary measures to improve the scientific excellence, age profile and mobility of staff in and out of the JRC, with the aim of enhancing the competitiveness of the JRC and reducing overall staff costs;

...*Considered* further that the JRC should, in addition to its predominant task, for the period 1988 to 1991, of executing specific programmes including preparatory research, nevertheless utilize the facilities and manpower at its disposal to strengthen and develop its work for other Commission services and for third parties in those areas in which it is competent so to do;

...*Believed* it essential that work for third parties should be developed, under the control of the director-general of the JRC and in cooperation with the Board of Governors, on the basis of clearly defined contractual arrangements with the Commission's services and third parties involved.

EC Creates Intercommunal R&D Budget

35190016 Paris LES ECHOS in French 2 Sep 88 p 8

[Article by Gilles Bridier: "First Communal Budget for Research"; first three paragraphs are introduction]

[Text] Two separate but nonconflicting trends are taking shape in the European civil and military aeronautics sectors.

First, across-the-board cooperation, which has long been practiced, but which sometimes engenders penalizing rigidities in international competition and which fails to match the industrial capital base of American competitors. Second, an integration of complementary activities on a national basis (in the UK and the FRG), which will allow new groups to carry more weight in communal bodies.

To support the emergence and competitiveness of this two-dimensional arrangement, Brussels is prepared to create a communal budget for aeronautical research. This will be a first...particularly for those governments ceding some of their traditional authority in this sector.

Brussels is preparing a research budget in the aeronautics sector. This is a new step. Never before has the EEC been interested in this industry, despite its extreme importance as much for technology as for trade or a strategic approach. The 3-year-long deliberations of the Euromart study group (composed of nine associations[1] and under EEC contract) have finally borne fruit, although the results will still be subject to arbitration.

In any case, the results represent a changing attitude on the part of the EEC governments, which agree to relinquish some of their power over the direction of occasionally strategic activities. For even private enterprises in this sector have always and forever been tightly bound to national strategic options. As it is, a communal research budget would confirm the governments' willingness to make a breakthrough in the same spirit as the one that presided over the emergence of the common market in armaments. It is true, however, that this willingness is dictated by economic motives, taking into account programs' increasingly steep development costs.

Initially, it is a matter of reacting to the U.S. Government's commitment to its manufacturers in order to reaffirm U.S. hegemony in this sector. However, it is also a question of countering the advent of new government-subsidized aeronautics industries. All this exists in a setting where the reference currency—the dollar—is held at ceiling values during all the negotiations.

The Euromart (European Cooperative Measures for Aeronautical Research and Technology) study was officially launched in February 1987. Basically favorable findings on civil aeronautics would seem to dim the prospects for the military sector. Between 1980 and 1986, the European aeronautics industry owned 23 and 28 percent of the civil and military aircraft markets respectively. This translates into a total turnover for that period of 69.5 billion ECU's (486 billion francs) and a yearly average of 9.9 billion ECU's (69 billion francs).

With the increased strength of the civil sector from 1987 to 2010, the yearly average could rise to 14.8 billion ECU's, or 117 billion francs, with a total of nearly 2,500 billion francs for the 24-year period. This increase, however, will be sustained by civil aircraft sales (32 percent of the world market), while the European aeronautics sector will suffer a 5-point drop (to 23 percent) in its share of the world market.

However, Europe must still be able to retain all its trump cards. In order for their commercial competitiveness to be based on technology, the 9 European manufacturers need well over the 370 million ECU's (nearly 2.6 billion francs) presently dispensed per year on research and technology (exclusive of development and without including engine and equipment companies). In their view, there is an urgent need to increase these kinds of expenditures by 25 percent, followed by a gradual upward trend until the present level of expenditures has been increased by at least 50 percent at the end of 5 years and by 100 percent at the end of the 1990's.

All this is very ambitious, but Karl-Heinz Narjes, vice president of the European Commission, himself provided the necessary impetus so that Euromart and its study would gain freedom of a city. A six-pronged approach involved civil and military aircraft, helicopters and V/STOL prop aircraft, and the successors to the Concorde (supersonic or hypersonic, the latter of which would be ready to fly around 2010 to 2015). This last development approach would stipulate only that there be no non-European partners. For before the successor to the Concorde sees the light of day, it will above all have to prove its commercial viability, which will involve a major apportionment of development costs.

Footnote

1. Aeritalia, Aerospatiale, Avions Marcel Dassault, British Aerospace, Casa, Dornier, Fokker, MBB, Sabca.

Technologies-Competitiveness Exhibition Opens in Grenoble

36980078c Paris AFP SCIENCES in French 13 Oct 88 p 10

[Text] Grenoble—The president of the French Foreign Trade Center, Jacques Maisonrouge, and the deputy mayor of Grenoble, Alain Carignon, on 12 October inaugurated in Grenoble the Technologies and Competitiveness (TEC) exhibition, which will enable 600 exhibitors to display the latest technological developments. This luxurious exhibition, which has a budget of 28 million francs, will subsequently travel to Turin, Barcelona, Newcastle, and Gratz before returning to Grenoble in 1990.

The largest section in the exhibit is a "scientific village," which combines the Grenoble universities, the CEA [Atomic Energy Commission], the CNRS [National Center for Scientific Research], and the National Center for Telecommunications Studies (CNET). These organizations will present scientific experiments and demonstrations. A very large number of major companies, such as IBM, Merlin-Gerin, Pehiney, Kis, Thomson and Michel Ferrier group, are represented.

France, Spain To Launch Joint Technology Programs

3698A324 Paris LA LETTRE DE SCIENCES & TECHNIQUES in French Jul-Aug 88 p 8

[Article: "Spain: Two New Research Programs"]

[Text] Two French-Spanish research programs have recently been set up. The first, known as an "integrated program," involves research laboratories. Its aim is to encourage joint projects through subsidies ranging from Fr 15,000 to Fr 60,000 per laboratory for a maximum duration of 3 years. The second, dubbed Mercury, involves researcher exchanges for periods of from 3 to 12 months and is aimed at researchers with fewer than 10 years of experience. French research workers in Spain will receive a monthly allowance ranging from 150,000 to 300,000 pesetas which may be added to their regular salary. The "integrated program" will begin in January 1989. Mercury is already under way; applications can be submitted until 30 September 1988. The two programs demonstrate Spain's desire to bring its research program out of isolation and give it a European dimension before 1992.

Report Describes BMFT's Preliminary Budget for 1989

3698M527 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 483/484, 15 Jul 88 pp 2-4

[Text] The recently presented 1989 BMFT budget (government plan), with total expenditures amounting to DM7,654.3 million, has increased by 2.9 percent over the 1988 budget estimate of DM7,439.1 million. According to FRG Research Minister Riesenhuber, the budget is characterized by:—a new increase in the basic research sector (just 38 percent, or almost DM3 billion);—further expansion of health research in the field of medical prevention (project subsidies up 5.8 percent). Environmental research activities of major research institutes will be intensified (up 4.5 percent) and there will be an increase in resources allocated for research on restoring culturally important buildings (up 14.7 percent);—a concentration on precompetitive research activities in key technologies: materials research (up 4.7 percent), physical and chemical technologies (up 39.9 percent), superconductivity and surface technology, laser technology, as well as aeronautics research and hypersonic technology (up 6.2 percent). Intensification of basic research on information technology at major research institutes;—growth in space research and technology (up 11.8 percent) which permits the implementation of decisions made by European governments.

Riesenhuber emphasized that the FRG has observed an increasing amount of independent initiative in company research. These firms now provide approximately DM35 billion, or 61 percent of all research funds (in 1982, by comparison, this figure was 56 percent). Today, R&D in the FRG is financed in a ratio of 5:2:1 by industry, the FRG, and the Lands. The BMFT budget represents about one-eighth (12.4 percent) of total R&D funds in the FRG.

The following tables provide an overview of individual research objectives and the increases and decreases in the proposed BMFT budget for 1989:

1989 Budget - Individual Plan #30

BMFT—DAFIN [as published] Overview (as of 7 July 1988)

Profile: Subsidy area/Subsidy priority	1989 Estimated Budget, in millions of DM	1989 Percentage of Individual Plan	1988-89 Percentage Increase	1988 Estimated Budget, in millions of DM	1987 Final Budget, in millions of DM
Individual Plan #30 Totals	7,654.3	100.0		7,563.7	7,339.9
Interdisciplinary basic research	1,566.7	20.5	0.7	1,555.7	1,503.7
basic subsidies for the Max Planck Society	457.4	6.0	3.3	442.8	430.1
special basic research fields	963.5	12.6	-0.3	966.5	959.5
geosciences (particularly deep drilling)	49.5	0.6	-11.4	55.9	32.3
humanities, social sciences	96.4	1.3	6.4	90.6	81.7
Long-term government programs	1,694.1	22.1	9.2	1,551.9	1,376.4
oceanography	98.5	1.3	5.7	93.2	64.8
polar research	64.5	0.8	4.1	62.0	58.6
space research and technology	1,332.1	17.4	11.8	1,191.4	1,058.4
nuclear fusion research	199.0	2.6	-3.2	205.5	194.6

1989 Budget - Individual Plan #30

BMFT—DAFIN [as published] Overview (as of 7 July 1988)

Profile: Subsidy area/Subsidy priority	1989 Estimated Budget, in millions of DM	1989 Percentage of Individual Plan	1988-89 Percentage Increase	1988 Estimated Budget, in millions of DM	1987 Final Budget, in millions of DM
Preventive research	1,004.7	13.1	2.7	978.0	898.6
ecological research	199.2	2.6	2.2	195.0	172.4
technologies to safeguard and protect the environment	159.0	2.1	3.6	153.5	145.9
water research	19.6	0.3	3.2	19.0	16.6
climatic research	41.0	0.5	1.6	40.4	37.1
safety research and technology	10.0	0.1	25.0	8.0	7.2
R&D for health services	327.8	4.3	1.8	322.1	281.7
ergonomics R&D	99.5	1.3	0.0	99.5	106.4
civil engineering R&D	41.3	0.5	14.7	36.0	32.6
interdisciplinary activities (including technological follow-up)	107.2	1.4	2.4	104.6	98.7
Market-oriented technology subsidies	3,075.4	40.2	-1.7	3,129.0	3,075.6
oceanography	65.6	0.9	-24.0	86.1	72.6
coal and other fossil fuels	179.6	2.3	-14.3	209.5	239.4
renewable energy sources and rational energy use	253.0	3.3	0.6	251.5	189.5
nuclear energy research (including reactor safety)	710.4	9.3	-1.2	719.2	754.6
information processing	232.9	3.0	0.4	232.0	217.5
technical communications	141.9	1.9	-5.8	150.7	155.5
electronic components	213.4	2.8	-12.7	244.6	233.3
microelectronics applications; microperipherals	69.8	0.9	-5.2	73.6	80.8
production engineering	115.9	1.5	-1.6	117.8	160.7
biotechnology	226.6	3.0	-0.4	227.4	205.6
materials research	214.0	2.8	4.7	204.5	193.3
physical and chemical technologies	243.6	3.2	39.9	174.1	149.9
aeronautics research and hypersonic technology	204.5	2.7	6.2	192.5	182.1
road transportation and traffic R&D	183.7	2.4	-16.9	221.1	221.7
safeguarding raw materials	20.6	0.3	-14.9	24.2	19.0
Framework conditions, infrastructure	439.9	5.7	-7.8	476.9	428.4
basic financing of the Fraunhofer Society	153.1	2.0	6.0	144.3	134.2
indirect subsidies, R&D personnel in industry	55.0	0.7	-31.3	80.0	57.6
improvement in transfer of technology and know-how	84.0	1.1	-5.6	89.0	75.2
subsidies for establishing technology-oriented companies	50.0	0.7	-10.7	56.0	54.4
technical information	97.8	1.3	-9.1	107.5	106.9
Total shortfall	-190.0	-2.5	0.0	-190.0	0.0
Ministry for Research & Technology	63.5	0.8	2.1	62.2	57.3

Increases in the Proposed 1989 BMFT Budget Compared to the 1988 Budget (exceeding DM5 million and 5 percent)

Subsidy priority	Excluding Basic R&D				Including Basic R&D			
Motivation for Increase (by program structure):	Estimated 1988 Budget	Estimated 1989 Budget	Increase, in millions of DM	Percentage Increase	Estimated 1988 Budget	Estimated 1989 Budget	Increase, in millions of DM	Percentage Increase
Basic subsidies for the Max Planck Society (3.3% increase)	442.8	457.4	14.6	3.3				
increase)								
Special fields of basic research, particularly for large equipment (starting operation of ESRF [as published] in Grenoble and FRM [as published] in Munich, as well as increased subsidies for university projects; decrease in basic R&D due to expiration of HERA funding program)	408.7	438.2	29.5	7.2	966.5	963.5	-3.0	-0.3
Humanities and social sciences (new buildings for the DHI [German Cultural Institute] in Paris and construction of the Japan Institute)	90.6	96.4	5.8	6.4				
Oceanography (marine geology and mud-flats research; transfer of activities from the field of marine technology)	87.0	92.1	5.1	5.8	93.2	98.5	5.3	5.7
Space research and technology, of which:	1,045.8	1,162.5	126.7	12.2	1,191.4	1,332.1	140.7	11.8
a) European Space Agency (development of Ariane 5, Columbus, and Hermes);	(699.0)	(800.5)	(101.5)	(14.5)				
b) national activities (intensification of technological studies and the national space exploitation program, D-2 mission)	(346.8)	(372.0)	(25.2)	(7.3)				
(increase in basic R&D due to construction of five DFVLR space research] centers)								
Environmental technologies (intensified basic R&D activities)	104.7	103.7	-1.0	-1.0	153.5	159.0	5.5	3.6
R&D for health-related services (priorities: increase in funding for AIDS research, tumor immunology, infectious diseases, tropical medicine, autoimmune diseases, and clinical research groups)	144.1	152.1	8.0	5.6	322.1	327.8	5.7	1.8
Civil engineering research (restoration of cultural buildings)	36.0	41.3	5.3	14.7				
Biotechnology (intensification of biological safety research, genome research, neurobiology, biosensors, and biological principles in virology and immunology)	164.8	171.7	6.9	4.2	227.4	226.6	-0.8	-0.4
Materials research (high performance materials)	121.0	125.0	4.0	3.3	204.5	214.0	9.5	4.7
Physical and chemical technologies (new development potentials for superconductivity and surface technology research, Eurolaser projects within the Eureka program)	85.7	124.5	38.8	45.3	174.1	243.6	69.5	39.9
Aeronautics R&D (scheduled program development, including main ETW [as published] construction phase and preliminary work for hypersonic technologies (Saenger))	100.2	108.7	8.5	8.5	192.5	204.5	12.0	6.2
Basic funding for the Fraunhofer Society (construction of new institutes)	144.3	153.1	8.8	6.0				

Decreases in the Proposed 1989 BMFT Budget Compared to the 1988 Budget (exceeding DM5 million and 3 percent)

Subsidy priority	Excluding Basic R&D				Including Basic R&D			
Motivation for Decrease (by program structure):	Estimated 1988 Budget	Estimated 1989 Budget	Decrease, in millions of DM	Percentage Decrease	Estimated 1988 Budget	Estimated 1989 Budget	Decrease, in millions of DM	Percentage Decrease
Geosciences (KTB [as published] cost trends)	54.3	48.0	6.3	11.6	55.9	49.5	6.4	11.4
Nuclear fusion research (decrease caused by the one-time 1988 to take over the ITER working group at the Fraunhofer Institute for Plasma Physics)					205.5	199.0	6.5	3.2
Marine technology (transfer of activities and funds to marine research)	54.0	33.0	21.0	38.9	86.1	65.5	20.6	24.0
Coal and other fossil fuels (reduction of industry-related subsidies, particularly for coal extraction, processing, and refinement)	199.0	169.5	29.5	14.8	209.5	179.6	29.9	14.3
Information processing (expiration of funding, according to the Information technology (IT) report, particularly for CAD in computer systems)	121.0	109.0	12.0	9.9	232.0	232.9	-0.9	-0.4
Technical communications (expiration of funding, according to the IT report, particularly for optical communications technology)	123.0	113.3	9.7	7.9	150.7	141.9	8.8	5.8
Electronic components (expiration of funding, according to the IT report, particularly subsidies for submicron memories)	197.0	163.2	33.8	17.2	244.6	213.4	31.2	12.7
R&D for road transportion and traffic (cost trends for the development of TRANSRAPID; return of OPMV [as published] funding)	219.5	182.0	37.5	17.1	221.1	183.7	37.4	16.9
Growth of R&D capacity (scheduled program development)	80.0	55.0	25.0	31.3				
Establishment of technology-oriented companies (required development of the model experiment)	56.0	50.0	6.0	10.7				
Technical information (reduction in favor of higher expenditures in individual fields)	92.6	83.0	9.6	10.4	107.5	97.8	9.7	9.1

TELECOMMUNICATIONS R&D

EC Plans Company To Promote High-Definition TV

36980052 Paris LE MONDE in French 16 Nov 88 p 43

[Article by Philippe Lemaitre, correspondent in charge of the European Communities in Brussels: "Faced With the Japanese Offensive, the European Commission Proposes a Plan to Support High-Definition Television"]

[Text] To win the battle of high-definition television (HDTV) against the Japanese competition, mastering the technology is not enough. It is also necessary to impose the system developed by European manufacturers on the largest possible market; this involves convincing TV professionals and making them familiar with the new equipment. In other words, as the marketing stage draws near, it is necessary to work out a program of promotion and demonstration of the European HDTV system. This is the goal of the "strategy" which the European Commission submitted to the governments of the 12 member countries on Tuesday 25 November. The stakes of the battle are considerable as, eventually, the 750 million of TV sets currently in use worldwide will have to be replaced.

In the past 2 years, some 20 manufacturers working on one of the EUREKA projects headed by Philips (Netherlands), Thomson (France), Bosch (FRG) and Nokia (Finland) have scored against the Japanese. In September 1988, at the International Radio-Broadcasting Congress in Brighton (England), they showed that they could introduce a complete TV chain, from studio equipment to receivers and including satellite transmission. There is now a European HDTV standard (1,250 lines, 50 Hz) which is compatible with existing TV sets (an immense advantage over its Japanese rival, although the Japanese are working on it), and its promoters dream of having it adopted as the sole world standard at the 1990 meeting of the International Consulting Committee on Radiocommunications [CCIR]. Meanwhile, they must make it known, sell it, and "prepare the post-Brighton era," as

Mr Michel Carpentier, chairman of the European Commission, in charge of information technologies, said Monday at a press conference.

Is it that marketing is still the weak point of our businesses? Actually, facing the Japanese, who have by no means thrown in the sponge, who offer their equipment for free to anyone willing to test it, who, to sum it up, try to create a need and therefore a movement in favor of their technology, European manufacturers behave as if the active efforts of their engineers were enough of an assurance; they seem faint-hearted and reluctant to finance a campaign to promote their equipment or to create programs.

Two Studios Equipped

It is to decide them, to overcome this handicap, that the Brussels Commission is now asking its 12 members to support them. Time presses: 1992 will see the introduction of the new equipment and the first European HDTV broadcasts. Four years is a short time to launch a new technology on the market.

The Commission recommended the creation of a European economic interest group as of 1 July 1989, already named European HDTV Research and Promotion Company; its members would include consumer electronics manufacturers, as well as TV channels and other broadcasters, film producers and the Commission. Its task, therefore, would be to promote and use European equipment. To prime the pump, without waiting for the creation of the economic interest group, the Commission suggested that the Community should cofinance initial demonstration facilities— which is precisely what the manufacturers participating in the EUREKA project wished.

The idea would be to make two fully-equipped HDTV studios available to producers. One studio would remain on a central site to be selected. The other would be a van designed for filming on location; it would travel throughout the Community to cover major events in the member states.

Using these studios would prepare producers as well as the general public for the commercial introduction of HDTV in 1992; in this respect, the Barcelona Olympic Games could provide an excellent opportunity at European level. The cost of these studios, estimated at 50 million ECUs [European Accounting Units] or Fr350 million, would be spread over the period 1989-1992.

The rest of the Commissions' proposal is not as well-defined, but the idea is the same: to encourage coordination among all those involved in HDTV, and offer its support to people who it assumes are focusing too much of their efforts exclusively on research and development. It therefore suggested that a plan of action be prepared for the progressive introduction of HDTV service in Europe during the 1990's; this would include broadcasting facilities (satellite, cables, ground facilities) as well as production facilities, which it is urgent to plan at community level.

As far as technologies are concerned, the Commission proposed to make the ESPRIT [European Strategic Programs for Research and Development in Information Technology] and RACE [Research and Development in Advanced Communications Technologies for Europe] programs available to identify bottlenecks and, already now, define standards for the new services. The proposals it submitted to the 12 member countries are political at least as much as economic. The Commission recalled the interest shown by heads of states and governments, at the Hanover summit meeting, for cooperation in the audiovisual sector, and it urged them to go ahead in the direction which they defined at the time.

AEROSPACE, CIVIL AVIATION

Joint Soviet-Bulgarian Space Mission Described

36980046 Paris AVIATION MAGAZINE INTERNATIONAL in French 1 Sep 88 pp 68-69

[Article by C. Lardier: "Second Soviet Flight: 'CHIPKA' Mission""]

[Excerpt] On 7 June 1988 at 1803 hours Moscow time, the Soyuz-TM5 spacecraft was launched from Baikonour with, for the second time, a Soviet-Bulgarian crew aboard. The crew members on this flight were Lieutenant Colonel Anatoli Soloviev, Flight Engineer Victor Savinykh, and Bulgarian cosmonaut Alexandre Alexandrov.

The Bulgarian cosmonauts selected in accordance with the governmental agreements for the second joint Soviet-Bulgarian mission of August 1986 began their training at Star City in January 1986. They were Major Alexandre Alexandrov, who had already been Gueogui Ivanov's backup for the first Soyuz-33 flight in 1979, and Lieutenant Kracimir Stoianov.

The composition of the crews was changed three times before the launching of the Soyuz-TM5 (code name "Rodnik") on 7 June 1988 from Baikonour.

Rendezvous operations for the linkup with the Mir orbital station took 48 hours, with docking taking place on 9 June at 1957 hours. The station's maintenance crew, consisting of Titov and Manarov, thus received their first visit after 6 months of solitude: The welcome was a warm one! The five men would be working together for a period of 8 days. The flight plan included some 40 scientific experiments involving 9 equipment packages built by the Bulgarians and delivered to the station by Progress-36.

Astronomy

The "Rojen" telescope forms part of the "Kvant" astrophysics module. It consists of an optoelectronic system whose receiver is cooled, a computer, and a digital recording system. It was calibrated on 10 June using the Serpens and Cygnus constellations, and was to be used to study various constellations, the Galactic Center, and star clusters, and to measure night-sky emissions and evaluate the polarization of emissions from astrophysical objects. Experiments: "Photometrie," "Synchrone," "Fond," "Polarisation," "Gaz Inter-stellaire," "Standard," "Dynamique," "Eclairer,:" and "Aurore."

Geophysics

Three Bulgarian equipment packages were used for remote sensing and a study of Earth's atmosphere: The "Paralaxe-Zagorsk" spectrophotometer; the "Spectre-256" 256-channel spectrometer; and the "Therma" pulsed photometer. The first was used to study the physical processes produced in the ionosphere and upper layers of the atmosphere (an altitude range of 60-400 km). The second was used for remote sensing, particularly for the "Georessource" experiment.

Technology

Four experiments were carried out using the Czechoslovak "Cristallisateur" oven. They concerned, respectively, the producing of a "Clement-Rubidium" high-ion-conductivity alloy (2 samples), an aluminum-copper alloy with added iron ("Structure" experiment), and an aluminum-tungsten alloy (composite materials).

Medicine and Biology

The process of adaptation to weightlessness was studied using several equipment setups:

Operator activity was studied ("Prevision" experiment) using the "Pleven-87" package.

Motor system activity ("Potentiel" experiment), of movements ("Statocinetique" experiment), the vestibular apparatus ("Labyrinthe" experiment), sensorial sensitivity ("Loisir"), and psychological state ("Questionnaire"), were studied using the "Zora" microcomputer.

Six psychological parameters were studied over a period of 24 hours, particularly during sleep and rest periods ("Sommeil-K" experiment) with the "Medelok" package.

Circulation through the cardiovascular system was studied with the aid of the "Reographe-2" (USSR), the "Oxymetre-2M" (Czechoslovak), and "TC-64" (Soviet Doppler-type equipment) packages.

Radiation dosimetry ("Dose-B" experiment) was carried on throughout the flight using the Bulgarian "Liuline" microprocessor-based radiometer. The "Vital" (lyophilized foods) and "Stimulateur" ("Vitaton" vitamins) experiments were provided by the Central Lyophilization and Cryobiology Laboratory of Sofia's Academy of Agricultural Sciences.

COMPUTERS

GDR's Cooperative Key Technology Strategies Reviewed

23020018b East Berlin STANDARDISIERUNG UND QUALITAET in German No 7, 1988 p 182

[Article by Felix Meier, Minister for Electrical Engineering and Electronics: "Scientific Cooperation for the Utilization of Key Technologies"]

[Text] Some of the main lines of development in the industrial sector of electrical engineering and electronics are microelectronics, computer engineering, and information processing, and new manufacturing technologies

such as high-vacuum engineering, electron-beam technology, and plasma technology. Electrical-engineering/electronics collectives are substantially involved and bear a considerable economic responsibility in other development lines as well, such as laser engineering and the nuclear power industry. In order to provide new products and methods in the shortest possible time on the basis of the dynamics of international developments, all the available capabilities of industrial research and development and of the scientific institutions must be fully utilized.

In this connection it is increasingly important for there to be a close and contractually based cooperation among combines, enterprises, and scientific institutions of the GDR Academy of Sciences as well as universities and colleges.

Within the last year 58 coordination contracts and 875 service contracts were concluded among the 15 combines in the field of electrical-engineering/electronics and research institutions, including about 500 agreements with the Ministry for University and Technical School Affairs and no less than 85 with the Dresden Technical University, the partner with 13 combines in this industrial sector. The contracts with the Dresden Technical University are based on the objective of achieving major breakthroughs by 1990 in further reducing the structural dimensions of highly integrated microelectronic circuits and in developing fast microprocessor systems, CMOS gate-array circuits, opto-electronic components, beam waveguides, and optical sensors for image recognition, and the objective of making available a new generation of image processing systems.

This cooperation between industry and science and the intended increased effectiveness resulting from this are also reflected in the fact that about 40 percent of the new products manufactured in the industrial sector of electrical engineering and electronics are being made with the assistance of research institutions. For products of microelectronics and computer engineering this involvement amounts to as much as 80 percent. A dominant feature of this scientific cooperation is the expansion of the practical-technology basis at the research institutions with the support of the industrial combines. This applies, for example, to the establishment of the Computer-science Center for the University System with the aid of the Robotron Combine VEB, and the building of a joint technological center for electrical engineering technologies by the Dresden Technical University and the Electrical Machinery Construction Combine VEB.

The scientists of the JENA Carl Zeiss VEB are in alliance with academic and university researchers. Their main partner is Friedrich Schiller University, with which many outstanding achievements have already been jointly performed. Joint engineering schools and the joint availability of research institutions are characteristics of such cooperative work. With an eye to the future, students are already being admitted into combine/university researchers' collectives and are participating in the solution of tasks set in the Science and Engineering Plan. In this way familiarity with practical work is imparted at an early stage.

One of the many results that have been achieved in joint work is a measuring system whose creators received the National Prize in Science and Engineering.

In research at the Robotron Combine VEB, tasks of central concern at present include the further development of CAD/CAM systems, data banks, and software technologies, improving the foundations for the creation of artificial intelligence, and new architectural concepts for computers. The combine is linking this research to close cooperative work with the scientific community. More than 100 service contracts form the basis for this research cooperation.

The deepening of cooperation in this field is also being expressed in the framework agreements between the president of the GDR Academy of Sciences and the rectors of the technical universities at Dresden and Karl-Marx-Stadt. For example, a research pool of about 300 scientists in association with the Dresden Technical University has been brought to focus on some key projects. The chief themes of this framework contract are research work on automation equipment and systems, electrochemical power sources, electric power plants, and three-phase drive equipment for electric traction.

Viewed as a whole, for one thing cooperation between production and science brings about a quantitative expansion of the research and development pools. For another thing it provides the possibility for a qualitative perfecting of the scientific focus of the research institutions and also of the research and development capacities in the combines and enterprises.

FACTORY AUTOMATION, ROBOTICS

GDR's CAD Package Handles Irregularly Shaped Workpieces

23020015 East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 9, 1988 pp 548-550

Article by Graduate Engineers B. Thieme and F. Hertel, members of the Chamber of Technology, VEB Center for Research and Technology, Dresden: "Flexible Design and Numerical Control Systems for Parts With Difficult Shapes"]

[Text]

Introduction

Because of the economic necessity to master increasingly complex developments over increasingly short time periods, more and more importance is given to the introduction of continuous computer-supported modes of operation in design and technological preparation, all the way to fabrication. Significant advantages in this connection are:

- Reduction of time for description, alteration and preparation of components
- Reuse of computer-internal stored shape elements
- Time reduction through computer-supported programming of NCM [numerical control machines]
- Increase in flexibility, possibility of producing a greater variety of parts with higher quality
- Reduction of heavy, physical work
- Minimization of subjective error possibilities
- Objectification of solution finding

Computer-supported solutions available up to now, such as PS AUTENT/KR[1], PS AUTOTECH-BOFR 32[2], PS GRAFIS, are either implemented on small computers (such as KRS 4201 or AKT 6454) and thus are not directly or always available for small or medium-sized companies, are designed only for special surfaces and/or shapes of parts (prismatic parts, double-curved surfaces) or offer no interfaces to prestored CAD systems.

The broad application of office and personal computers with graphic peripherals offers the possibility of creating efficient work station- oriented CAD/CAM solutions. The flexible design and manufacturing procedure for parts with difficult shapes, developed at the VEB Center for Research and Technology, is a continuous CAD/NC [numerical control] solution, based on office and personal computers, for computer-supported design, manufacturing preparation and 3-D-NC milling preparation for parts with varying surface shapes.

1. Concept of the CAD/NC System

The schematic construction of the CAD/NC system is shown in Fig. 1. The system is characterized by three subsystems. These are adapted to the various types of computers of the CAD or NC system, to data transmission to the subsequent system, or to archival storage of data.

In the CAD system, the designer describes the intended final state of the component. So far, the output data have been a list of parts and a technical drawing. For direct transmission of the data to the NC system, this information must be appropriately prepared. The preparation takes place through a conversion system, which produces a drawing and a file describing the component. Technical and technological data are not yet contained in this set of data.

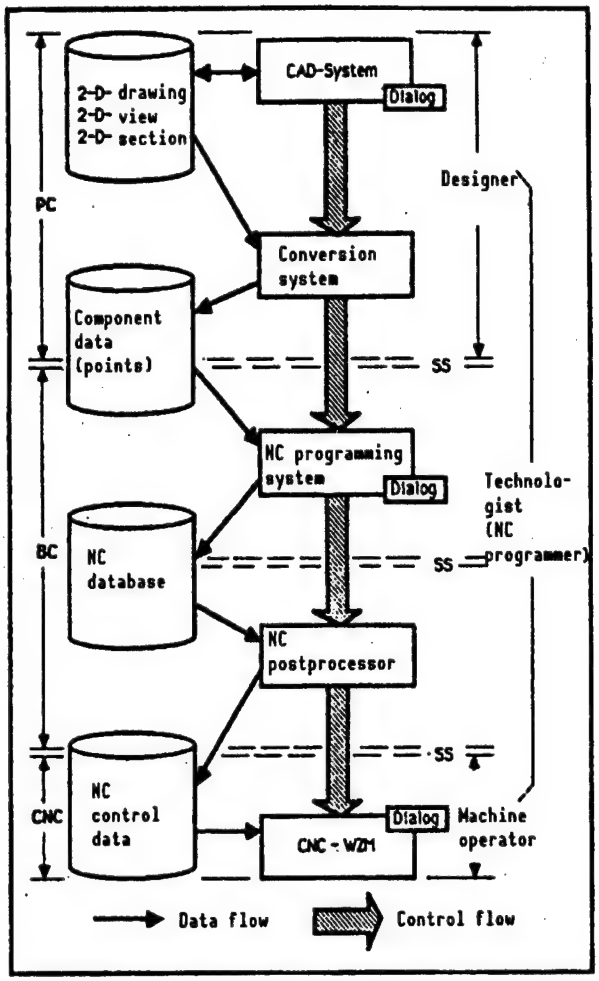

Figure 1. Architecture of the CAD/NC System

A component file and a program-adapted and technical drawing are the entry data for the NC system. The technologist defines, and feeds through the NC system, the geometrical elements or surface elements which are relevant to the processing from the individual points of the component file. These geometric data are coupled with the technological information (nature of processing, initial and return conditions for the tool, interface values) and form the "NC base data" for the NC postprocessor, depending on the actual type of machine and control, from the component file and the NC base file of the NC control data.

2. CAD System

The use of a computer-supported CAD system (hardware configuration, see Fig. 2) is the first step in order to be able to react rapidly to special, short-term customer wishes.

Components and shape elements, which are subject to a high degree of change or customer specifications, can be produced with the help of the processing principle of

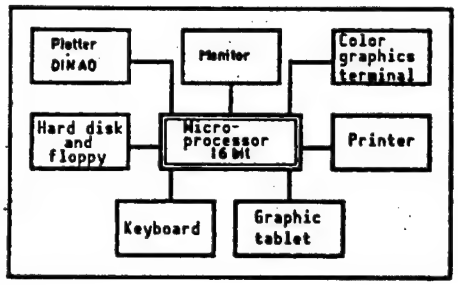

Figure 2. Hardware system configuration for CAD System

"variant construction" on the basis of user- specific programs. By varying the entry parameters within a fixed range of parameters, parts and shapes with altered measurements and/or shape are produced. The second manufacturing principle is the generation method[3]. In this, the component is completely described in a graphic, interactive, two-dimensional manner, by means of the geometric elements defined in the system (lengths, arcs, points, planes). For this the user has available to him extensive functions of basic CAD software (combinable input methods, extensive geometry functions, rounds, mirrors, enlargers, cutouts, automatic dimensioning).

The image data are stored as an image file on diskette.

The designer can then return to these data at any time and edit, detail and manipulate them in order to create new image files.

The capacity of the CAD system can be seen in Fig. 3. If a component is to be produced for an NC program, the information contained in the construction drawing must be edited and prepared for the NC system.

Within the CAD system, the technologist must select from the construction drawing, individually store and insert the views, sections and individual data relevant to processing and insert the initial point necessary for the manufacturing of the workpiece. The geometric elements contained in the views, sections, etc. are dissolved through a conversion program into the points (beginning, ending points for straight lines, curves, center points) that describe the elements and are stored in an NC data file. At the same time, a drawing adapted to the NC program, which contains the index point positions, is produced. From these images, and the pertaining converted point file, it is possible for the NC programmer in the NC system to define the geometric data necessary for the three-dimensional control of the NC machine. Geometric data such as position tolerance and machining precision must be taken into account in the NC system by the technologists.

3. NC System

The additional processing of source data takes place with the NC processor program system (hardware configuration, see Fig. 4). The NC processor (capacity, see Fig. 5) is like the conversion program software of the VEB Central Office for Research and Technology, Dresden, and contains the functions necessary for 3-D-NC programming of parts with difficult shape.

The mode of operation is operator-guided with simultaneous syntactic control of the entry values.

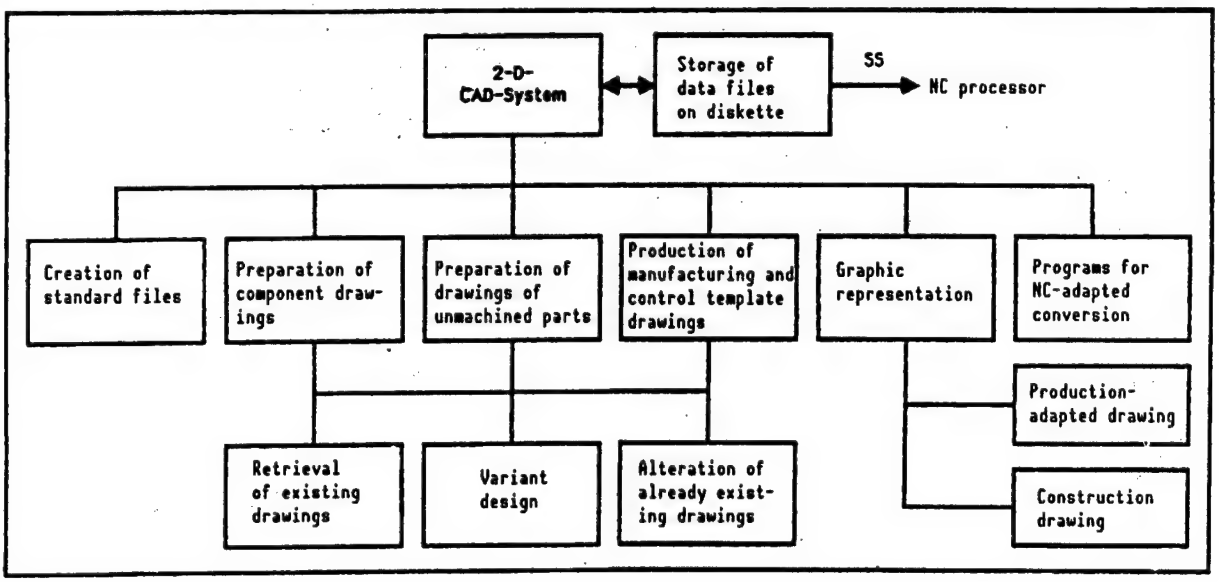

Figure 3. CAD System

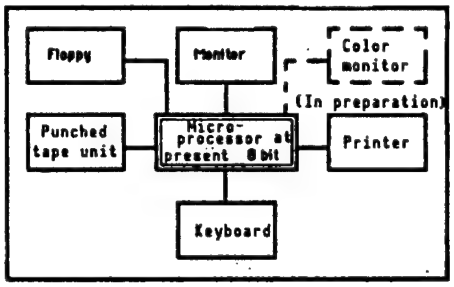

Figure 4. Hardware System Configuration (BC 5120) for NC Processor

The NC processor supports the production of control data for the following tooling methods:

BAHN—Milling of polygonal sections with constant or changing cutting depths

VER—Milling of convex or concave cubic formations with specific surface curves

FRAES—Processing of frequently occurring milling cycles

BOHR—Processing of borings and boring patterns.

The geometric and technological descriptions of the specific processing operations take place within each module for a tooling procedure.

In the BAHN tooling procedure, the contour to be produced is defined by the technologists by indicating the point sequence.

Furthermore, the tool placement, type of tool, the cutting values, the constant, zero shift, processing loops and turnaround times, as well as the initial and return conditions of the tool, are defined.

A tool file is available for tool definition. The tools are selected and transferred from it, or new ones are entered.

The cutting values can be entered manually or generated from a cutting value file.

For the VER processing method the surface piece to be worked on is defined from the initial contour and final contour point, radii of curvature and special surface modifiers.

Processing precision is established by indicating divisors.

The FRAES and BOHR processing methods are based on standard subprograms. Definition takes place analogous to the BAHN processing method.

Determining the sequence of processing as well as defining approach and return points is done by the processing sequence menu.

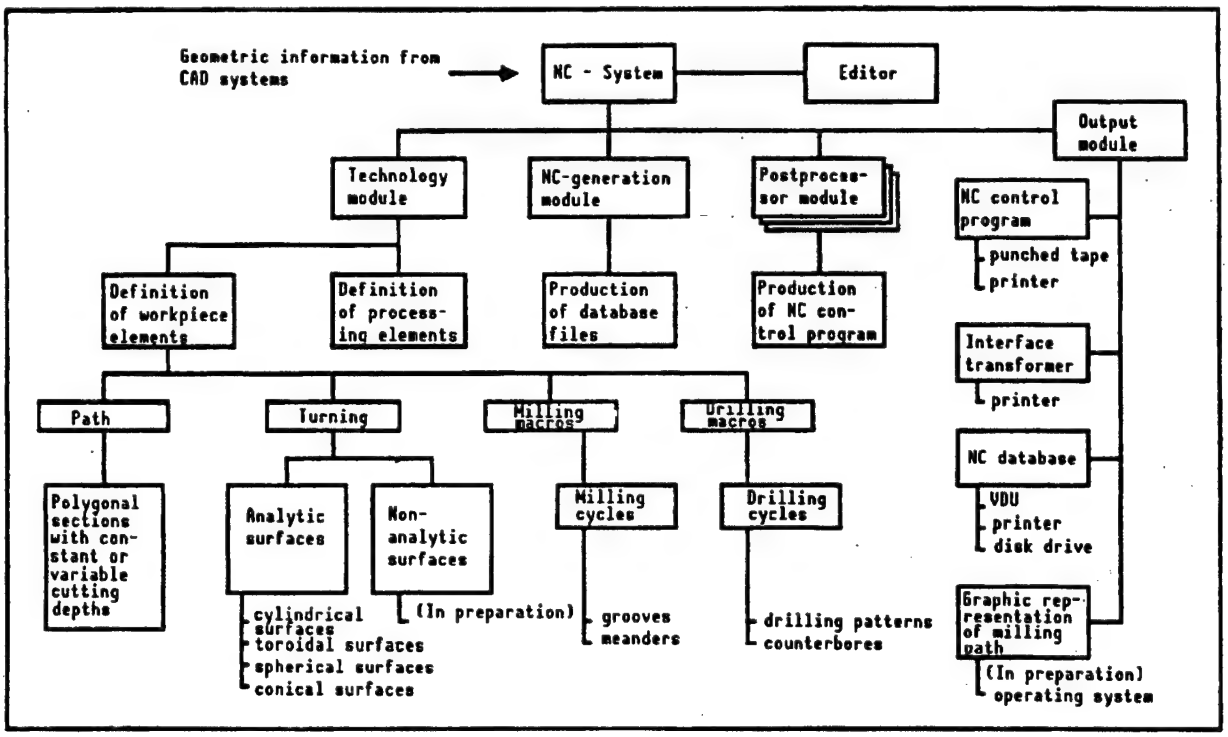

Figure 5. NC Processor, Operating Environment

After completely working out the source data for the component to be processed, these data are compiled or condensed in an NC base file.

The production of the NC control program takes place through the subsequent NC postprocessor run, by connecting the geometric information (NC data file) with the technological information (NC base file).

The NC control program is stored on diskette and can be transmitted via a screen, printer or as a punched tape.

At present, a postprocessor exists for the CNC 600-3.

4. Summary

The CAD/NC system described here offers the following advantages:

- Use of various hardware and software components for design or NC programming in a continuous solution
- Use of computer technology (BC, PC) near the work station and the resulting increase in flexibility and availability for the worker
- Simple production of NC control commands and instructions (knowledge of NC language or a source program language is not absolutely necessary)
- Exact and complete readying of geometry data by the CAD system
- The most far-reaching reduction of error possibilities through automatic syntax checking in the NC system
- Relief of the NC machine tool through abbreviation of the testing and correction phase of NC control programs, since these are substantially free or errors through the use of shape elements.

In order to perfect and raise the efficiency of the NC system, the intention is further to develop this system with regard to the programmable variety of shapes (including double-curved surface pieces and additional processing cycles), the introduction of interactive graphic work in order to define the surface elements to be worked on and graphic representation of tool movements.

In addition, preparations are under way for coupling the NC system to a 3-D-capable CAD system, thus achieving a higher level of quality in data transmission (transmission of shape elements) and definition of the tooling method.

The NC system developed at the VEB Center for Research and Technology, Dresden, is available for practical application.

Bibliography

1. Kochan, D., Bonitz, P., "AUTENT-KR mit DIGA—ein Anwendersoftwaresystem Fuer Doppelt Gekruemmte Teileformen" [AUTENT-KR With DIGA—a user software system for parts with double-curved shapes], contribution at the INFERT 86 conference at Dresden Technical University, Section for Production Engineering and Machine Tools.

2. Frohberg, W., Thierfelder, S., "Maschinelle Programmierung von NC- Maschinen auf Robotron-Buerocomputern" [Automatic programming of NC machines for robotron office computers], FERTIGUNGSTECHNIK UND BETRIEB, Berlin 36 (1986) 2, p 100.

3. Spur, G., Krause, L., "CAD-Technik" [CAD Technology], Munich-Vienna, Carl Hanser Verlag, 1984.

GDR Examines PC Applications in Industrial Production, Control

23020016 East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 9, 1988 pp 551-554

[Article by W. Baerecke and H. Leistner of the "Otto von Guericke" Technical University of Magdeburg: "PC Use for Tasks of Production Planning and Control"]

[Text]

Introduction

In all spheres of the national economy, all levels of enterprises, computers are being used for a variety of task areas. The reason for the continually increasing number of computers in enterprises is the stagnation in growth on the world market, the result of which is the availability of more complex, higher-quality products that generally feature more customer-specific functions (1) (2). In addition, shorter delivery times and greater adherence to deadlines are gaining importance in the competitive situation. Taken together, these new demands increase expenditures for operational information processing in two ways: On the one hand, they cause greater expenditures on development, construction and quality assurance, while on the other hand there is a rise in expenditures for planning and controlling the increasingly more complex production processes (3) (4).

The new demands, which clearly require a new quality level in information processing, can only be met in the long run through the use of modern, efficient computers.

The following is an examination of potential applications of personal computers (PCs) in operational information flow for tasks of production planning and control, since this class of computers in particular is becoming increasingly important for industrial applications, due to its easy manageability, its high degree of mobility and its continuous growth in capacity. Moreover, it is very well suited for a first introduction to computer technology.

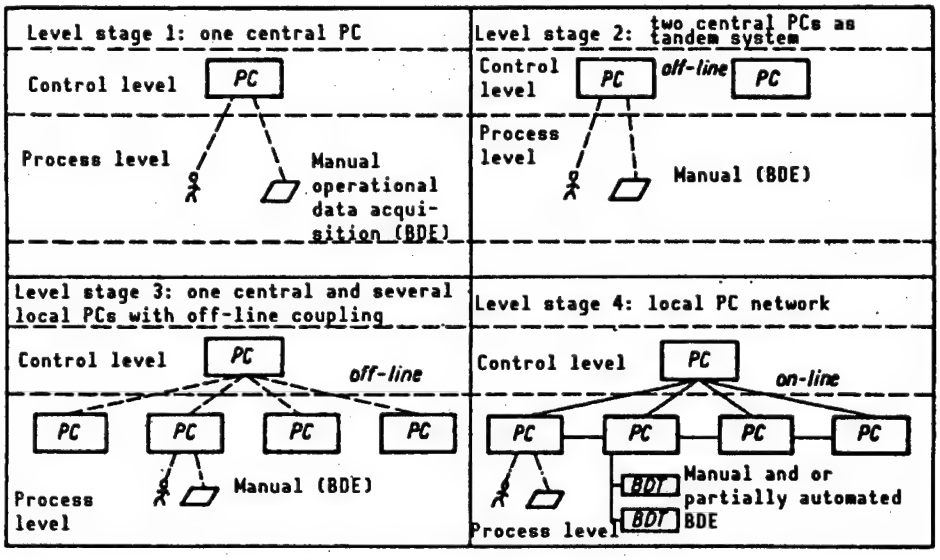

Figure 1. Equipment Level Stages of PC Use for PPS Tasks

1. PC Structures in the Enterprise Information Processing System

The introduction of solutions involving automated, computer-supported information processing must be preceded by the establishment of a strategy for the entire enterprise dealing with the application of computer technology in the near and distant future. Based on this strategy, it is determined where and in which sequence personal computers (or other classes of computers) are to be deployed. Computers must be deployed step-by-step, in development or level stages. For PC applications, these stages can be described by way of the structure of the computers used (Figure 1).

- Structure 1: One central PC as an isolated computer system

This development stage is characterized by the following advantages and disadvantages:

—Advantages:
- — high transparency of data processing activities under way
- — problem-free data storage and updating

—Disadvantages:
- — can be used only for a narrowly defined range of tasks
- — no process-oriented operational data acquisition is possible
- — lack of a process-oriented inquiry system
- — use of the PC on the control level results in acceptance problems by the work force deployed on the process level.
- — failure of the PC results in system failure

This first development stage is appropriate for initial applications of computer technology and in some cases for small areas and sets of tasks.

- Structure 2: Two central PCs as an isolated, tandem computer system

This variation offers the following advantages over the first structure:
- — can be used for a large volume of tasks
- — system remains functional in the event of personal computer failure

For initial applications, there is the advantage that PPS functions can be realized on one PC while the second PC is used for program work and tests.
PCs as a hierarchical computer system

In this third structural variation, a PC deployed on the control level functions as the master system, to which (depending on need and availability) several personal computers are subordinated in key departments and functional areas. The coupling between the central and locally attached personal computers is off-line. This hierarchical structure brings with it a number of advantages:
- — process-oriented operational data acquisition by way of the locally attached personal computers
- — process-oriented inquiry system by way of the locally attached personal computers
- — preprocessing of the acquired operational data and transmission of already-compressed information, as well as further processing of information from the host computer by the personal computers on the process level; these characteristics result in significantly less work for the host computer in the event of the failure of a locally deployed personal computer,

the system remains functional; in the event of the failure of the central host computer, it is no problem for a local PC to assume its functions, so that even in this case the system remains functional.

However, compared to the previous structural variations, data management and updating is considerably more complicated, requiring a plan for offsetting these disadvantages. This plan involves prioritizing individual personal computers to update defined data files and exchanging the updated data files according to an established schedule.

- Structure 4: Several local PCs as a computer network system

The goal of this type of network is to diminish redundancy in data storage. In concrete terms, this means that the central host PC manages the master data and the data files for accounting and statistics, and also directly accesses the transaction data managed in the locally attached personal computers. Data is processed by the locally attached personal computers accordingly. In addition, there is the possibility of automated operational data acquisition.

For this type of operation, with locally managed date files and direct access, together with at least partially automated operational data acquisition, a high-capacity personal computer is required that should make it possible to perform multitasking, which is the simultaneous operation of several programs according to established priorities. At present, this type of PC network is not yet possible, due to the capacity and technical interfaces of current personal computers. For this reason, the highest structural level that can be applied in practice at present is the hierarchical PC computer network system.

3. Practical Example of the Application of a Hierarchical PC System

3.1. Problem

Because of the trend towards a greater number of parts in smaller lot sizes and minimal processing time, heightened demands are being placed on flexibility and disposibility in enterprises, in order to be able to react quickly to changing customer demands. At the same time, process continuity must be assured. In order to meet these conditions, it is necessary to decisively improve control over the production process. One essential precondition for this is local computer technology. The use of this new resource is in fact inevitable, since the increase in the level of PPS means a continual rise in the volume of information that can no longer be managed using conventional technology.

A complex program system for controlling the production process has been developed at the Technical University of Magdeburg. This program system can be used to control foundries, but also to solve control problems

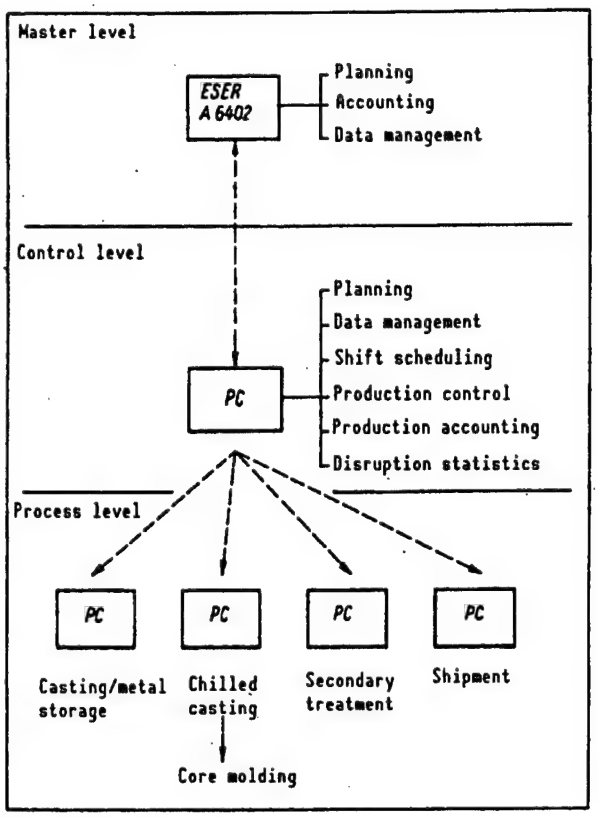

Figure 2. Basic Set-Up for PC Control in Foundries

in component production and assembly. The design and introduction of the PPS system is oriented towards a plan for gradually introducing locally attached computer technology. The first, already-realized development stage involves initially deploying a personal computer as an auxiliary resource for control purposes. This development stage is completed by deploying more computers in selected technical departments.

The goal of using computers to control the production process is to create a complex solution that covers the entire process, from receipt of order to planning/advance preparations, production control and accounting to shipment. The control system developed at the "Otto von Guericke" Technical University of Magdeburg represents a solution that realizes the above-mentioned functions while achieving the corresponding development stages.

3.2. Set-Up for the Control Solution

The basic set-up for control in foundries using a PC is depicted in Figure 2.

The following areas are explained below:

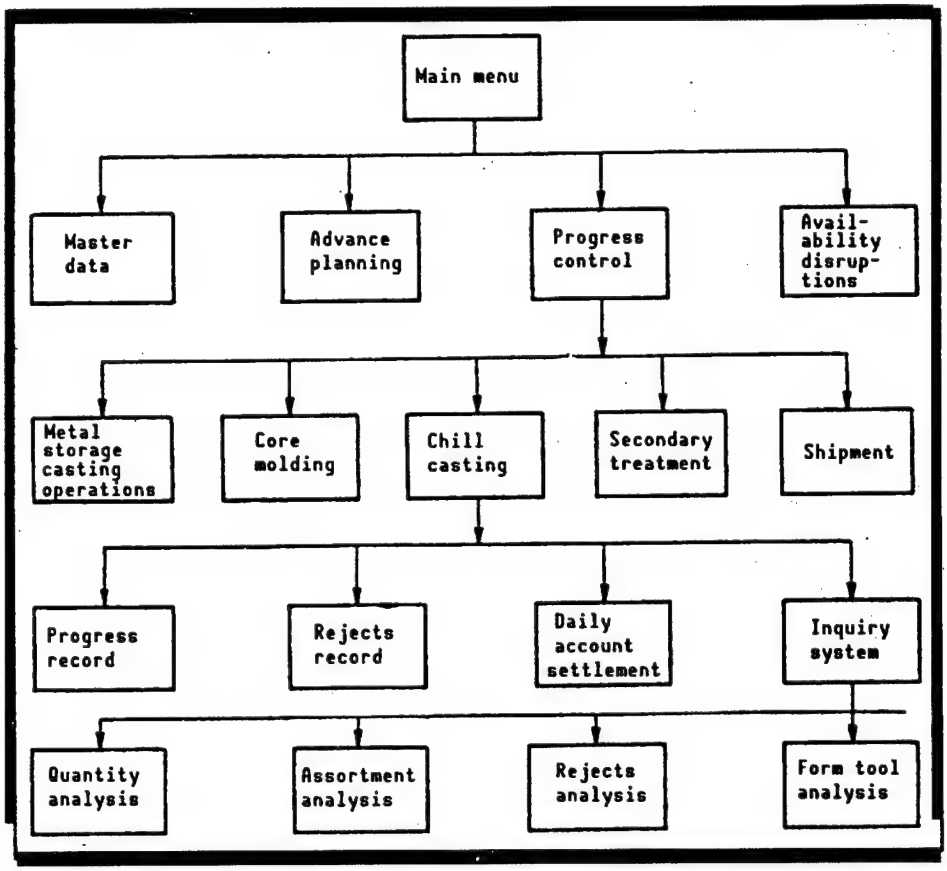

Figure 3. Structure of the Program System

All the tasks required for control and as a precondition for control, such as: planning, data file management, production control, production accounting, disruption statistics, are performed by one or more interconnected PCs that are set up on the control level.

This set-up does not rule out the possibility of using hierarchically structured computers that perform certain tasks of planning, data file management and accounting.

It is projected that stronger penetration of the production process by computer technology will be achieved through the deployment of more PCs, which will work locally on the process level. Applying them in the individual departments means various advantages, such as a diminished burden on the computer technology on the control level, process-oriented data acquisition and the development of damage assessment variations.

The program system for controlling the production process is hierarchically structured, and the selection of the individual program modules is done through menus. Figure 3 shows an overview of the program system, based on the example of a foundry application.

3.2.1. Master Data File Structure

The problem of editing master data files is a key function in introducing local computer technology, because this significantly affects such decisive criteria as

— processing speed,
— data redundancy,
— data protection and up-to-dateness.

The quality and content of these data files are critical to the range of application and practicability of the computer-supported production organization. In order to meet requirements in terms of

— avoiding duplicate storage of identical data,
— user-friendly management of the system,
— short access times,

the data file set-up depicted in Figure 4 was developed. It can be seen that the master data file is divided into six subfiles that are interconnected by data pointers. The subfiles contain the following information:

VERZEICHN.STM:	List of all orders
AUFTRAG.STM:	Labels of orders without company
ABGANG.STM:	Labels of operations without identifier

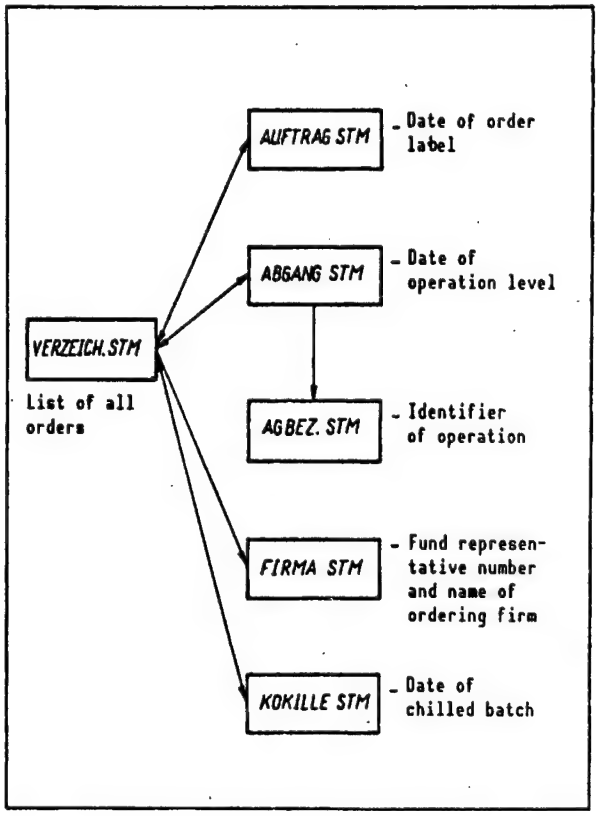

Figure 4. Structure of the Master Data File

FIRMA.STM:	Fund representative number and name of ordering firm
AGBEZ.STM:	Identifiers of operations
KOKILLE.STM:	Labels of basic form tools

In addition to the technological data, these subfiles also contain the necessary linkage pointers.

Besides efficient use of available external memory, this data file set- up has significant advantages for updating data. For example, if the fund representative number, the firm name or an operation identifier is changed, the corrected information is immediately applied to all relevant orders and operations. This ensures not only less work, but also uniformity in the identifiers that are used.

3.2.2. Progress Control

Another important precondition for the successful use of a computer- supported system for controlling the production process is the availability of real production data, which on the one hand are needed for exact accounting, but on the other hand constitute a basis for forward planning. The use of PCs on the process level is also to be viewed with this in mind; besides reducing the burden on computers on the control level, this should serve the goal of process-oriented data acquisition in particular.

What aspects should be given particular attention in the use of locally attached computer technology for production control?
- — The computer technology will not be used by computer specialists, but rather by the foundry personnel.
- — Attention to organizational sequences both in the program structure and in the data file set-ups.
- — Achievement of a high degree of preprocessing of operational data on the process level.
- — Assurance of central data access for more far-reaching system services, such as central accounting and inquiry system.

In applications realized thus far, both the production status and the total rejects have been recorded. This procedure, which presupposes certain local conditions, clearly shows the above-noted aspect with respect to achieving as high as possible a degree of preprocessing when using local computers. Besides the acquisition function, a local- station PC can take on overall accounting of production, including detailed analyses of rejects. This transfer of tasks that are actually central in nature from the control level to local PCs means less of a burden on central computer technology and greater transparency of the production process, even on the process level.

In setting up the acquisition programs and necessary data file structures, particular attention was given to the aspect of integrating organizational sequences in the new data processing system. The following aspects in particular are relevant for practical use:
- — reproducibility of data on inquiries and for more advanced analyses and account settlements
- — optimally fast access to individual data
- — simple use of the acquisition program with the possibility of interrupting acquisition
- — elimination of the possibility of manipulation through changing already-completed input

In order to meet these criteria, the data file set-up depicted in Figure 5 was developed for transaction data.

Summary

A step-by-step plan should always be used to introduce complex solutions to PPS on the basis of local attached computer technology. One approach that has proven beneficial is the creation, initially for one department, of a vertically universal and detailed solution, which realizes the functions of planning, advance preparations, production control and accounting.

The solution created for an area must first be subjected to extensive tests and experiments in practical operation, whereby user acceptance is particularly important.

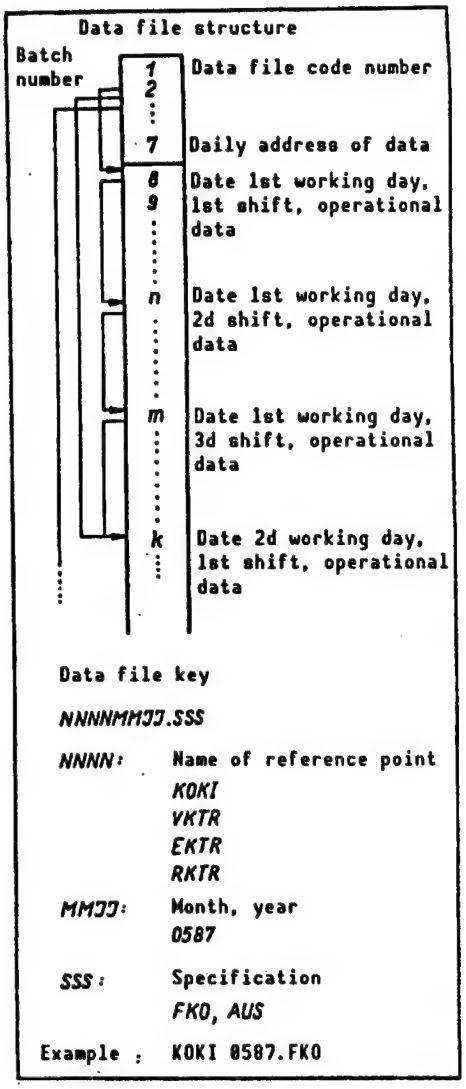

Figure 5. Data File Set-Up for Production Data

It is only after the successful, practical introduction of solution elements that further components for completing the overall system should be incorporated.

In the authors' experience, the focus point of introducing these systems is the conceptual preparation of the overall system and the step-by-step realization of adaptable solution elements.

Bibliography

1. Richter, W., "Automation: Bridge Between Theory and Technology," TECHNISCHE GEMEINSCHAFT, No 12, 1984, pp 6-7.

2. Eversheim, W., et al, "Produktionsplanung, Produktionssteuerung in der CIM-Realisierung" [Production Planning, Production Control in CIM Realization], Berlin/Heidelberg/New York/Tokyo: Springer- Verlag, 1985, pp 68-94.

3. Gottschalk, E., "Everything Flows: Planning and Controlling Production in Flexible Manufacturing," MASCHINENMARKT, Vol 93, No 24, 1987, pp 46-51.

4. Foerster, H.-U., and Syska, A., "Focal Points, Trends, Problems," VDI-ZEITSCHRIFT, Vol 127, No 17, 1985, pp 649-652.

MICROELECTRONICS

Dynamic Growth of GDR Microelectronics Reviewed

23020019 East Berlin PRESSE-INFORMATIONEN in German No 127, 1 Nov 88, p 6

[Text] In the GDR, microelectronics has entered upon the fastest development pace of all the branches. At present there are more than 120,000 workers in the nation's economy who are involved in this sector. Since 1980 the value of semiconductor components manufactured annually in the GDR has risen more than sixfold to over 2.9 billion marks. Production of integrated circuits alone has grown since 1980 by about 220 percent, to 120 million units in 1987. Today our republic belongs to the small group of countries that are dominant throughout in the development and application of microelectronics, including important initial materials.

Currently the economy of the GDR is meeting about 80 percent of its needs for microelectronic components from its own output. Microelectronics offers possibilities for savings in material, energy, and labor time on a new scale. If one wanted to bring about in a conventional type of construction that which is already achieved by a 64-kilobit memory circuit, then the required transistors, capacitors, diodes, resistors, printed circuit boards, and plug connectors would weigh a total of 250 kilograms. On the other hand, the 64-kilobit chip weighs only 1.5 grams. And the 256-kilobit memory circuit is no heavier, although it already replaces nearly a ton of conventional components.

At present about 1,500 basic types of microelectronic components are being used in the GDR from its own and from CEMA production lines. Currently the USSR and our republic are working resolutely to fulfill economically paramount agreements, especially those of "Microelectronics" and "Passive Components." Today, microelectronics is the starting point for a fundamental revamping of many products.

One aim is to increase by 1990 our own output of active semiconductor components, especially integrated processor circuits and memory circuits, by over 26 percent

annually. In the case of passive components (resistors, capacitors, plug connectors, printed circuit boards, filters), growth rates of 12 percent annually are to be achieved.

By the end of September 1988, collectives of the GDR's microelectronics industry had achieved a growth of 34 percent for semiconductor components and 49 percent for monolithic integrated circuits compared to the same period of the previous year. With their outputs the workers are focusing their attention on quadrupling the degree of integration of the components every 2 years and thus on rapidly increasing memory capacity.

A year ago this economic sector started using 256-kilobit chips from its own production facilities, thereby reaching the present state of the art internationally in this important sector. These circuits combine 600,000 transistor functions at a time in an area the size of a fingernail, and in storage capacity they are comparable to earlier mainframe computers. They are still the most widely used chips for computers around the globe.

In mid-September 1988 a collective from the JENA Carl Zeiss Combine VEB introduced the first 1-megabit memory circuit produced in the GDR, thus forming the groundwork for gradually proceeding to its mass production. These chips perform over 1 million transistor functions; 35 closely spaced typewriter pages can be stored on such a component. Each of these chips is able to replace many tens of thousands of transistors, diodes, capacitors, and resistors—all in all a great step forward in the struggle to reach the highest state of the art internationally and in putting into effect our economic strategy, in which microelectronics fills a key position in our policy on behalf of the welfare of the people.

A collective from the JENA Carl Zeiss VEB, the Institute for Semiconductor Physics of the GDR Academy of Sciences, and the Karl-Marx-Stadt Technical University received the 1988 National Prize First Class in Science and Technology for its contribution to the creation of scientific-technical foundations for the development of the 1-megabit memory circuit and the technology to manufacture it.

In all, 14 billion marks of capital expenditures have already been invested for the development of microelectronics, because this fundamental key technology materially influences the productivity of the entire economy. Whereas within the previous 5-year plan period in the GDR one new semiconductor factory commenced operations, in the current 5-year plan one such factory opens each year. All of this serves the objective of creating broad applications opportunities in the economy, in order to achieve an increase in efficiency above all via a pronounced increase in per-capita productivity, which is necessary for the continued successful realization of our economic and social policy.

Advances in microelectronics are also increasingly being reflected in the quality of consumer goods. For example, in color television sets the energy consumption of the devices is reduced considerably and their reliability is increased through use of integrated circuits. By means of integrated circuits a new heart pacemaker, distinguished by its small size, long service life, and high reliability, allows for changes to be made in the way it functions, if necessary, even after a completed implantation—something that was not possible previously.

Now that new circuits are being produced over a wider range and in greater numbers and rationalization is moving forward, the time has come to utilize microelectronics even more than before for greater unit quantities of consumer goods in demand. Low-end computers and small electronic typewriters from our own production plants are already on the market. Preparations are being made for the manufacturing of yet other products.

GDR Develops Microcomputer-Controlled Positioning System

23020008 East Berlin FEINGERAETETECHNIK in German No 9, 1988 pp 395-398

[Article by H. Herberg, H. Schott, Dr. B. Schmidt, C. Hesse, Academy of Sciences of the GDR, Central Institute for Nuclear Research Rossendorf: "Micocomputer-controlled Positioning System with Optoelectronic Positioning Sensor"]

[Text] The increased use of computer technology, in particular microcomputer technology, for monitoring and controlling processes requires new sensor technology components [1]. These are primarily components which permit high-resolution, interference-free and wear-resistant measurements under industrial conditions. These components should also provide output signals which can be recorded by subsequent information-processing units through an appropriate analog or digital interface. The following article presents an optical hybrid-integrated circuit measuring in two dimensions (HIPFD) which meets most of the above mentioned requirements [2].

The application example shows the use of this sensor in a computer-controlled positioning system. The area on the circuit usable for direct positioning measures 10 mm x 10 mm. By changing the coupling conditions between the object and sensor circuit, i.e. by a mechanical or optical change of the scale, the usable positioning area can be increased or reduced. This computer-controlled positioning system is used for the two-dimensional recording of points on specimens such as circuits, surfaces of micrographs, medical preparations, and similar, where the coordinates are selected by the operator. These coordinates are stored in the computer, and during the repeat cycle they are driven by the computer via appropriate actuators. When the position has been reached, manuipulations of any kind can be perfomred with a repeating accuracy in the range of 5 to 10 um [3] [5].

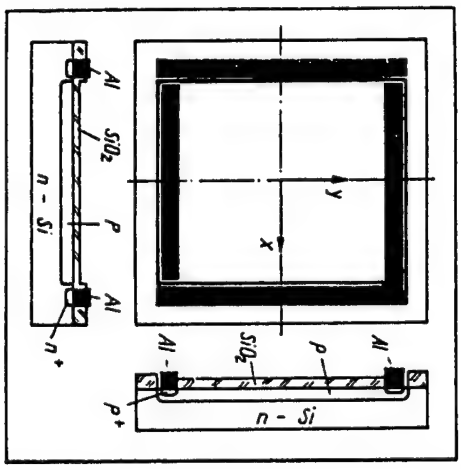

Figure 1. Technological Diagram of the Holohedral Diode

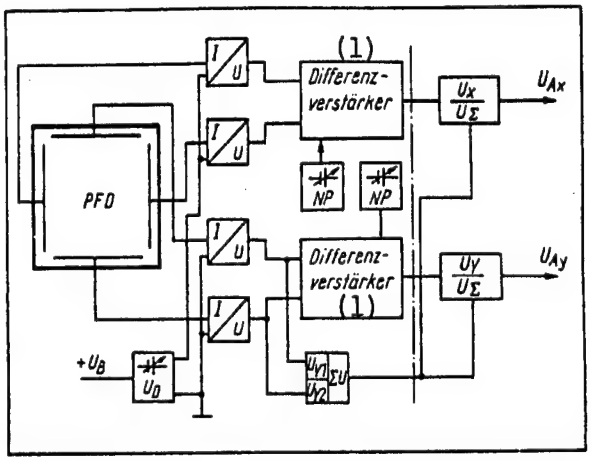

Figure 2. Block Diagram of the Positioning Circuit—1.Differential Amplifier

1. Positioning System Components

1.1. Positioning Circuits

A position-sensitive holohedral diode measuring in two dimensions (PFD) from the Central Institute for Nuclear Research Rossendorf is used as a sensor element. This sensor element, an optoelectric transducer, generates electrical output signals with information on the position of the location of incidence (X,Y) and the intensity (P) of a light beam on the sensitive PFD surface. The center of intensity of the incident light beam is always measured, so that neither a maximum diameter (limited by the desired modulation range) nor a homogenous light beam are required. The PFD shown in Fig. 1 is a silicon semiconductor component manufactured by planar technology whose P/N transition was generated by ion implantation. The total area of the PFD chip is 14 mm x 14 mm with the active, light-sensitive area (10 mm x 10 mm) located inside the four lateral aluminium contacts. The holohedral diode is sensitive across the complete visible wavelength area up to the close infrared range. Depending on the operating point, the maximum is between 750 nm and 900 nm. The linearity between input signal (shift of a light point dx; dy) and the output signal (output currents dix; diy) are an essential criterion for the quality of a position-sensitive holohedral diode. The sensor element used here has a linearity error of less than 1 percent.

—Analog Evaluation Circuit

To be able to use the sensor easily and to reliably process the noise-sensitive PFD signals the sensor element was built into a standard package together with the preprocessing electronics using hybrid circuit technology. The light beam is radiated onto he photodiode through a window in the cover. Figure 2 shows the block diagram of the hybrid integrated positioning cuircuit (HIPFD). The PFD which is operated in a quasi short circuit is coupled to the preprocessing electronics via I/U transducers. In each channel X and Y, differential amplifiers are connected which provide the corresponding channel signals U(x) or U(y).

In addition to these signals, the circuit also provides a summation signal U(p) which is proportionate to the intensity of the incident light. Two direct current sources allow electrical zero point offset. All amplifier elements were produced with monolithically integrated chips B 062.

This has the following advantages:

- Sensor element and subsequent electronics are available in one chip.
- There is almost no interference between sensor and evaluating electronics.
- The hermetically encapsulated chip is easier to handle than the non-encapsulated chip and is also protected against environmental effects.
- The operating voltages used are -15 V and +15 V. The output signals in the range of -10 V...+10 V are values common in measuring technology; they are easy to manipulate, can be easily transmitted and processed further.
- The ouput resistor (approx. 2 KOhm) allows easy coupling to analog/digital converters.

Figure 3 /not reproduced here/ shows the open and the encapsulated hybrid circuit. The PFD is mounted in the center below the window. The passive (resistors) and active (diodes and amplifiers) components are located on the substrate around it. The passive components and connecting lines are produced by suitable standard methods of thick-film technology. The active components are inserted into the circuit as bare chips and then bonded. For specific applications, the user can integrate additional components into the complex using the external ports (e.g., for changing the output amplification, capacitive feedbacks for signal equalization.

1.2 Control Technology Layout

Microcomputer System

A modular 8-bit microcomputer system MPS 4944 [4] based on the U880 (Z80) processor and developed by the Central Institute for Nuclear Research of the Academy of Sciences constitutes the core of the application example. It is comparable to the K1520 system by the combine Robotron. The system consists of the central processing unit (PK88), a bus display (BUSA), the 16KByte read-only memory with the utilities standard monitor and BASIC-interpreter, the 48 KByte main memory (RD48) for the monitor work cells and for user programms, the I/O interface (SIF1000) for alphanumeric keyboard and display driver (ANTVT) with alphanumeric display. Another I/O interface is used to connect punched tape technology which can also be replaced by cassette tape units. For process control in a specific application it may be necessary to record analog signals U(x), U(y) U(p). This is done with an analog value multiplexer (MUX) which can switch up to 32 measuring points on one channel, and a single-channel analog/digital converter (ADC) . The conversion range is -10V ... +10 V with a resolution of 11 bits and an operational sign (5 mV/bit). Use of a 14-bit ADC is planned to obtain higher resolution. For processing, the functions to be executed must be passed on to the actuators. A digital I/O unit (DEAS) is used to provide the number of steps as pulse sequences as well as the directional signals for the stepper motors. To safeguard the system the DEAS input channels are used to poll stop position switches as warning signals which prevent incorrect movements. This allows a definite movement controlled by the motor step movement which is also monitored by the HIPFD. For other control levels, for instance, linear motors can be used where positioning is done by the sensor circuit alone. The complete system is shown as a block diagram in Figure 4; Figure 5 /not reproduced here/ shows the device configuration.

The mechanical arrangement is a microscoping device consisting of a table with two coordinates and a stereo microscope to view the objects. The table is driven by two stepper motors which use gears to generate the positioning movement in the X- and Z-directions. The design of this system permits positioning accuracies under 2 um. A light source acting as a coordinate sensor is firmly attached to the table and projects the position directly onto the sensor circuit. As explained under #2.1, the HIPFD generates three analog signals from the coordinates of the intensity center and makes them available to the analog multiplexer of the microprocessor.

Positioning Drive

The stepper motors are driven by the microcomputer via driver units. As explained under #2.3, the number of motor steps for both axes is determined by the momentary position and the destination point value. This

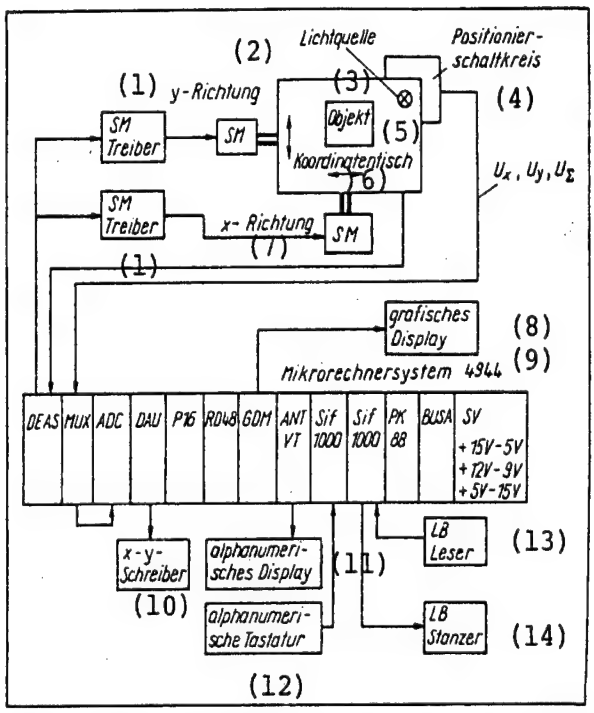

Figure 4. Block Diagram of the Complete Positioning Circuit

Key:—1.SM Driver—2.y-Direction—3.Light Source—4.Positioning Circuit—5.Object—6.Coordinate Table—7.x-Direction—8.Graphic Display—9.Microcomputer System 4944—10.x-y Recorder—11.Alphanumeric Display—12.Alphanumeric Keyboard—13.Punched Tape Reader—14.Tape Puncher

number is then fed to the driver as a pulse sequence und a directional signal. These units also use type 8537 hybrid-integrated circuits by the combine Ceramic Works Hermsdorf. They assign the voltage signals for the individual motor windings. These control circuits are followed by power transistors which switch the required winding current for each winding. In principle, it is possible to use other motors with related control levels and a software modification.

1.3 Software

—Basic Software

For this application, two programm packages were implemented in the MPS 4944 microprocessor system. For basic initialization, it has a standard monitor program which drives and operates the system, the keyboard and the display routines, and contains many subroutines and checking functions. In addition, the system contains a BASIC interpreter which can be used to execute mathematical operations and make decisions in a programming language made easy for the user. In addition, BASIC and ASSEMBLER programs can be easily connected.

—Application Software

In the application discussed here the advantages of BASIC and ASSEMBLER are utilized. BASIC programs are used for controlling purposes everywhere, and ASSEMBLER subroutines for input and output operations. This allows for fast operation of the I/O modules using the assembler programs, and the simple programming language can be used to execute mathematical and logical functions.

—Input Dialog (INPUT)

During system start-up, a dialog with the operator is run on the display which defines the programs in greater detail; in addition, parameters such as accuracy class, number of points, and similar items can be agreed on.

—Center Point Adjustment (CENTRE)

This program was developed to set the coordinate origin (X= 0, Y= 0) of the system. After the program has been run, the mechanical system is fixed so that the light source is positioned exactly in the center of the HIPFD and can be operated in all four directions with maximum level control. Then the specimen is centered with the microscope.

—Point Registration (TEACH-IN)

The keyboard functions and the display dialog are used to move to the desired position on the specimen. Once it has been reached the coordinate values of the HIPFD and MUX and ADC are recorded and stored. This procedure is repeated for the operator-selected number of points to be recorded.

—Point Representation (REPEAT)

After the error interval has been determined, i.e. the permissible range of deviation from the destination point, the previously determined points are approached in cycles. This is done as follows: The difference values are determined from the current state (actual coordinate) and the destination point (set coordinate), and the number of steps in the X- and Y-directions are calculated from those values.

This provides a so-called rough positioning in the immediate proximity of the destination point. Then, individual steps and a comparison of the actual coordinate values with the destination coordinates as well as the error interval are used for precise positioning. When each point has been reached, it is shown on the display with the coordinate values and the deviation. Then, certain manipulations can be performed (e.g. establishing contact with circuits).

All subprograms are designed so that the calculations and decisions as well as data storage can be done in BASIC, while MUX and ADC (with data conversion) operation and the stepper motor control is done with ASSEMBLER programs. This ensures rapid execution of I/O operations, while calculation operations which are difficult to perform in ASSEMBLER are performed by the BASIC interpreter, which is, however, relatively slow.

2. Other Positioning Circuit Applications

The principle that a light point can be projected from a transducer to the sensor circuitry with any coupling method offers a variety of applications in many industries.

Figures 6 to 11 /not reproduced here/ show schematic drawings for the recording of

—rotary movements—one- and two-dimensional movements—angle and position—three-dimensional coordinates using two sensors

This partial list of solutions indicates that robotics is a major application area where many movements have to be monitored. This sensor circuit can also be used for measuring oscillations, e.g. in machine parts, bridges, etc.

3. Summary

The positioning system presented here is an application example of the hybrid integrated positioning circit HIPFD. Basically, two-dimensional length measurements of 10 mm x 10 mm with a resolution of 10 um are possible, from which the respective applications can be determined. For most application examples, a higher positioning precision is conceivable, since the linearity error of the PFD itself is of no importance. When the coordinate values are located again, the computer connection eliminates the errors caused by non-linearity. The ADC with an 11-bit resolution constitutes the present limit. With a 14-bit ADC it is possible to obtain a positioning accuracy of 2 um. When the measuring range is extended mechanically or optically it should be noted that the resolution also changes by the corresponding factor. By integrating the sensor and the analog electronics for signal preprocessing in one housing it is possible to block out major interferences; in addition, they can be easily mounted in devices. The supply voltages and the output levels allow direct connection to control devices and microcomputers.

Bibliography

1. Biebler, K., "Sensors on the Basis of GDR Semiconductors," RADIO FERNSEHEN EIEKTRONIK, Berlin 34, No 8, 1985, p 479-480.

2. Schmidt, B., Schott, H., "Application of Hybrid Technology for Integrating Sensors with Components of Subsequent Electronics," International Hybrid Conference Gera, 1984.

3. Schott, H., Herberg, H., "Proc Microcomputer Controlled Position Sensitive Measurement System," 5th International IMEKO Symposium "Intelligent Measurement-INQUA-MESS 86", Jena 1986.

4. Author collective, "Modular Microcomputer System MPS 4944," ZfK Rossendorf, 1st ed., 1979.

5. Herberg, H., Schott, H., Schmitt, B., Hesse, Chr., "Microcomputer Controlled Positioning System," "INFERT 86" Conference of the Manufacturing Machine Building Section of the Technical University Dresden, 1986.

Bulgarian 'Smart' Fire Control Terminal Described

2202005 Sofia SERZHANT in Bulgarian
No 10, 1988 pp 12-13

[Article by Lieutenant Kolyo Stoev: "Gun Commander's Terminal]

[Text] Speeding up the pace of application of scientific and technical achievements is a primary mission in the unit in which Dimitrov, an officer, serves. For the first time a fire control officer's terminal with audiovisual display and a reply option has been developed in this unit. It is connected by cable to the senior battery officer's dedicated computer over a distance of up to 1000 meters.

The fire control officer's smart terminal is the same size as a small commander's field pouch and from the viewpoint of design consists of two basic units, a front (basic) unit and a rear (power supply) unit. The basic unit consists of a baseplate on which are mounted a 6802 microprocessor and a 2732 EPROM in which the control program is recorded, along with two PIA 6821 used for digital display control. A separate plate holds two VQE 24 digital display units, a 5-volt stabilizer, and central processing unit detection circuitry. The rear power supply unit contains a 12-volt storage battery with a 2 ampere-hour capacity.

The display plate is mounted on the front of the terminal; over it is a decorative plate on which a template for an initial artillery command is engraved. The command is output twice in two rows. This arrangement is necessary to reduce the area taken up by the displays and the total power consumption of the display panel.

The front panel has 4 test and control buttons mounted on it and 3 light emitting test diodes for monitoring terminal operation. The exterior of the fire control terminal is shown in Figure 1.

From the viewpoint of circuitry, the terminal is made up of a 6802 microprocessor. One advantage of using this microprocessor is that the microprocessor contains a clock generator. This in turn makes it easier to start up the terminal and reduces the number of components required. One PIA is used to create a dynamic display-controlled by a specially IN program. The display elements are connected to the PIA by way of buffers. The purpose of the buffers is to increase the power consumption potential of the buffers. The second PIA is used to create an input/output interface for connection with the central computer. It is embodied in a 20-milliampere current circuit which is uncoupled on both sides. Data is transmitted from and received by the central computer by means of an ASIA, while in the terminal the ASIA is replaced by a PIA, whose operation is simulated by software. A 16-kilohertz clock pulse transmitted from the CPU times the ASIA and the PIA.

Only 3 bits on page A of the PIA are used for this purpose. The next 3 bits are used for monitoring the "row 1," "row 2," "review," and "ready" switches. The other 2 bits and all of page B of the PIA are used for connecting a small keyboard during repair and diagnosis of the terminal. The 3-kilobyte control program is recorded in the 2723 EPROM. An IC 6116 is used for RAM; it can support a low-voltage power supply in the event of failure of the basic power supply. All this makes it possible to store data over a prolonged period of time.

The possibility is provided of testing the connection with the central computer. The test is carried out by switching the terminal on while not connected to the central computer, or, if the computer is not connected to the terminal display, STOP is displayed. This occurs whenever the time frequency of 16 kilohertz is not present. When this frequency is present, the terminal is placed in the ready mode. When the frequency is increased with the power supply not switched on, a key is activated which supplies power to the terminal, and the terminal emits an audio signal at a frequency of 1 kilohertz for 1 second. The audio signal is repeated after a wait of 1 second. This process continues until the terminal's power supply is switched on.

The fire control officer's terminal makes this officer's work much easier, while reducing the time required for carrying out commands and the possibility of error.

SCIENCE & TECHNOLOGY POLICY

Head of National Technical Development Committee Interviewed

25020014b Budapest MAGYAR HIRLAP in Hungarian
17 Sep 88 p 5

[Interview with Pal Tetenyi, President of the OMFB /National Technical Development Committee, by Istvan Palugyai; place not specified: "Thoughts About a Troubling Situation"]

[Text] It has been almost nine months since the proclamation of the government's work program and the introduction of new regulations and tax law. In the sphere of technological development, however, there are no signs of improvement. On the contrary (as this was

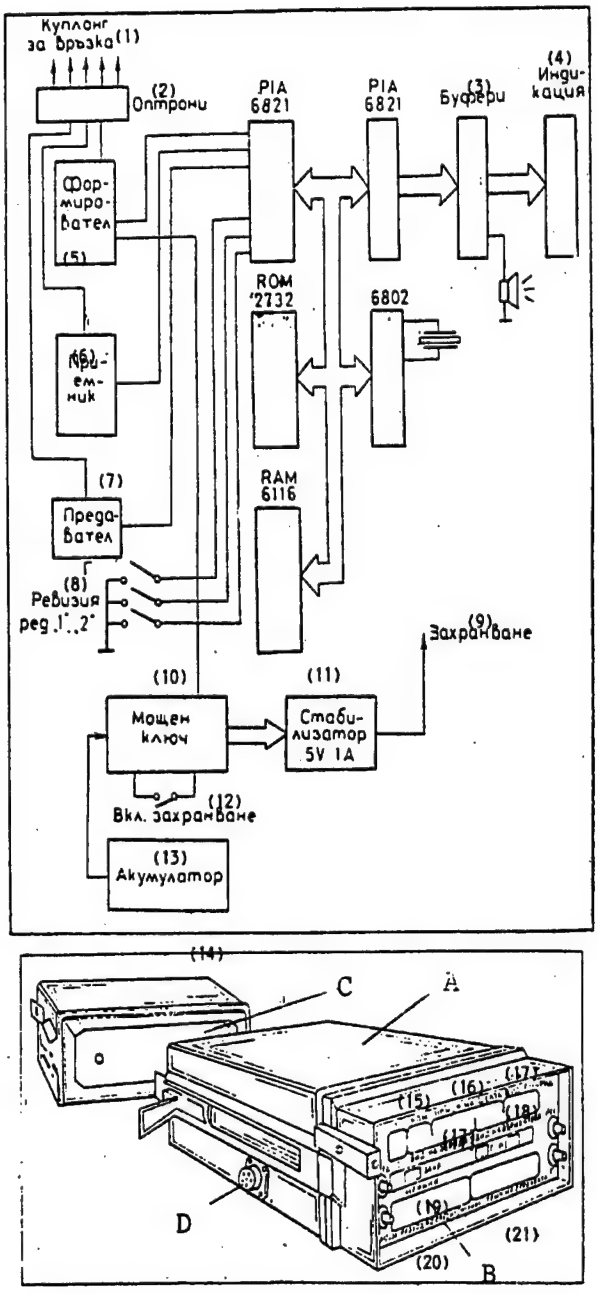

Figure 1. Smart fire control terminal containing the A. Basic unit, B. Screen, C. Power supply, and D. Adapter for connection to senior battery officer's computer.

Key:1. Connection adapter—2. Optrons—3. Buffers—4. Display—5. Driver—6. Receiver—7.Transmitter—8. Revision, rows 1, 2—9. Power supply—10. Power key—11. 5-volt, 1-ampere stabilizer—12. Power supply switch—13. Storage battery—14. Block diagram—15. Command—16. Target number—17. Charge type—18. Power supply—19. Range—20. Number of rounds fired—21. Rate of fire

voiced at the recent national conference on technological development), the enterprises and research institutes find themselves in an increasingly poor situation. The OMFB has already expressed its anxiety, which has grown to radical self-criticism, of our economic management practices. When it comes to conditions in education and training, Pal Tetenyi, the president of the OMFB, has gone as far as talking about a troubling situation. Does this lively critical activity also imply that the governmental body, so crucial for the cause of technological development, has been curtailed in its activities?

Tetenyi: I would not say that. When it comes to direct resources for technological development, they have not decreased since 1987, and the leadership managed to make up for much of the losses brought on by the devaluation of money. To be sure, the subsidies received by research institutes have been reduced, even in real value.

For my part, I do not measure opportunities primarily by the quantity of material resources set aside for subsidies. My conviction is that we must increasingly use these resources in accord with market demands, in an entrepreneurial manner. For example, by providing innovation credits or through methods that are based on the mobility of venture capital. In former times, regrettably, we have instituted a number of technological development programs that ignored economic considerations, while others were not oriented toward raising technological standards. This year, however, there are signs of movement; for example, the OMFB received more export-intensifying applications connected to technological development. However, processes that result in technological development are time-consuming; we cannot expect to see spectacular growth in a few months, especially since until now the utilization of economic and fiscal resources was not connected to the idea of technological development. What we need are practices in economic policy-making and technological development that unite the demands for a lasting increase in exportability, a reduction of costs and an improvement of technological standards.

MAGYAR HIRLAP: Just now you referred to subsidizing the deployment of venture capital. However, the innovation banks that are working in that area find the present fiscal situation restrictive.

Tetenyi: Enterprises working with venture capital were established this year, within the framework of innovation banks. We tax those banks on the basis of their direct profits, even though the process of innovation itself is a rather lengthy and risky process, while the deployment of venture capital, as its name suggests, brings results only after a longer period of time, and the potential for loss is also inherent. Thus, we need a system of evaluation that takes as its basis the degree of capital growth, and also discounts the losses. We are striving to

have such special regulations introduced; but it is also a fact that, as of today, innovation banks still carry on mixed activities, and thus it is difficult to provide such benefits for them.

MAGYAR HIRLAP: You are being low-key in your discussion, as if the situation were not too bad.

Tetenyi: To me, the greatest hazard is the weakening of intellectual capacity. Much of those graduating from elementary schools are insufficiently prepared even for vocational schools. As for technology and natural sciences, the number of people planning to teach those subjects has decreased to an alarming degree, to the point that even the quality replacement of teachers is endangered. But not only is their number low, their education is also lacking, and often the universities are unable to remedy this. Very few individuals choose to become teachers, and many of them leave the profession. This is alarming, because shortcomings of this type cannot be corrected in five or ten years; we are talking about matters that may decide a country's fate even for decades. We are also aware of the fact that for years to come the national budget will not offer suitable conditions for our education system.

MAGYAR HIRLAP: It was stated at the Gyor conference that the OMFB started work on developing a comprehensive technological development concept. There are many who will shiver at the thought of hearing about another concept: There are too many plans, and not enough changes. Do we need another concept at this time?

Tetenyi: One of the most important governmental tasks in overseeing technological development is to establish certain fundamental directions, based on global developmental trends and domestic possibilities, and to promote progress in those directions, along with entrepreneurial and institutional research sharing the same goals. In every civilized country of the world, this is the task of government organs specializing in technological development. The OMFB also worked out its mid-range developmental concepts for the 1986-1990 period, and we find that substantially valid. However, the turning point in economic policy-making, brought in by the Central Committee's June resolution, can only be implemented if it is combined with suitable goals in the area of technological development. Rather then describing the concept in detail, let me mention a few issues: Fundamentally important, for several reasons, is the development of productive infrastructure. Our backwardness in such areas as, for example, telecommunication and transportation, costs us tens of billions of forints each year. It is also characteristic that our country's electrical network loses about 11 percent of its energy. While the countries of Western Europe continuously reduce their loss, in our country the loss keeps growing. The development of the infrastructure is based upon modern techniques (primarily electronics); thus, it means markets for modern technological products. The state, as a consumer, supports communication techniques, electronics and the manufacturing of vehicles, while also setting quality standards for these fields of production. The development of the infrastructure is required also in order to connect our economy into the huge systems of Europe's developed countries, and even to contribute to the dynamic growth of tourism in our country. A further point of the concept calls for general improving technologies in the machine industry and introducing, at least occasionally, the most modern processes.

MAGYAR HIRLAP: The proposal mentions reduced efforts when it comes to material- and energy-saving methods that also need to be subsidized. Have we had enough of frugality?

Tetenyi: It appears that the taxation system, by itself, does not promote thrift sufficiently. Due to the fact that, as of January 1988, all subsidies connected to economizing projects have been eliminated. This year our enterprises signed a total of three contracts for energy-saving projects, compared to the over 300 signed in 1987. What this means is that we must find the conditions that will, once again, make thrift attractive. Also included in our concept is the subsidizing of basic research in biotechnology and in the natural sciences, when applicable to technological development. According to the concept, the entire process of technological development, together with the modernization of the infrastructure, production, planning and research, is supported by electronics, which is one of the most important elements in the competitiveness of a society. This applies to industry and agriculture, education and research, state administration and commerce; in fact, it is a specialization that permeates all activities.

MAGYAR HIRLAP: According to many people, technological development is a question of abilities, money and incentives. Of these, we have a good supply of only the first component, although, as you said, even that is diminishing. We should mention something else in this connection. More and more intellectuals lose their patience because for years there has been nothing but talk about improving their situation; they feel that the leadership cannot step over its own shadow and choose to go abroad, either by signing long contracts or remaining there permanently. It is said that last year there was an especially large number of young intellectuals who did not return home. How do you see this problem?

Tetenyi: I am not familiar with the statistics. As for the problem itself; what we are talking about is a lack of prestige for qualified work, which applies mostly to the intellectuals, but also to skilled workers. For years now we have been pointing in every direction: Problems should be solved by the enterprises, says the government; while the enterprises are waiting for central measures to be taken. The majority of university graduates work in professions that are paid out of the national budget; and why should an enterprise pay an expert three times as much as he would get at a university or in a public

institution? As of now, our unified labor market does not allow us to make such distinctions, and so budgeted wage-increases remain definitive. In spite of this, some of the enterprises are trying to give bigger raises to economists and technical personnel than to other employees; and starting next year they will be able to do this more freely.

Conversely, there is also a view according to which the earnings of workers in the budgetary sector should keep pace with the earnings at the enterprises. However, we cannot expect radical changes because, as previous experience showed, blue-collar labor was more difficult to obtain and was, therefore, considered relatively more valuable. As for taking jobs abroad, considering the size of the phenomenon, I do not see it as something threatening the country's future; in fact, the experience our specialists gain abroad bring many advantages. We are importing new methods, experiences and ways of approaching and solving problems in this manner. By the way, sooner or later it will have to become natural, just as it was before the war, that a good technician spend as much as four or five years working abroad. We should strive to maintain genial and constant relationship with Hungarian specialists who spend shorter or longer time working in other countries. I would caution against placing any administrative restrictions on traveling outside Hungary. What I would prefer to see is a broadening of opportunities for scientific workshops, an improvement in their atmosphere, so that no one should be driven away for personal reasons, professional jealousies or the lack of prospects.

MAGYAR HIRLAP: In order to accomplish those goals, of course, we would have to raise the real value of research and development allocations to today's level from that of the 1970s, to which they have sank and make changes in the counterproductive fiscal regulators. What are the OMFB's ideas concerning this within the new concept?

Tetenyi: We must improve the fiscal conditions of the entire process of innovation. Every research and development activity, including those taking place at the enterprises, should be granted tax exemptions. We are also recommending that enterprises be allowed to consider the achievements they generated as part of their holdings. We are proposing that it be made possible to depreciatie capital equipment more rapidly at all processing enterprises where the profit-to-property ratio is higher than 10 percent. There should be much lower duties on bringing the latest technologies to our country, and there is an urgent need to liberalize the import of developed techniques.

Finally: Within one or two years we should introduce the practice, used by many countries, according to which the sales tax on products of new technology is reduced, and thus their distribution is assisted. However, all of these would help only enterprises that operate in a genuine market economy; enterprises that would be able to increase their production by increasing their hard currency exports, which demand technological development.

MAGYAR HIRLAP: Forgive me for interrupting, but not even a monetary economy such as that of England allows the managers to have full control over technological development. When it comes to this sphere of activities, central control remains dominant even there.

Tetenyi: At this time, 55 percent of the amount allocated to technological development is money that belongs to the enterprises. This proportion is in accord with the demands, and it is about even with the European average. However, the crucial factor is not proportion, but actual value. Looking at it that way, the direct per capita resources of K+F [R&D] amount to only about a third or a quarter of the Western European investments. Nevertheless, the greatest problem is not with the direct resources involved in technological development, but the restricted opportunities for introducing the results of research. Under these conditions, the state should concentrate its resources on tasks that are beyond the direct interests of enterprises.

MAGYAR HIRLAP: It would be nice to see an increased interest on the part of each member of the enterprise's collective. That might be quite helpful for technological development.

Tetenyi: I agree, but that is not the task of the OMFB. In any event, the concept assigns a major importance to the modification of state and cooperative property, through which the handlers of the property, the enterprise's workers, would become interested not only in their annual earnings, but also in the lasting operation of the firm and in utilizing the existing resources to produce long-range results. In a situation like that, a good workplace becomes valued, and the potential of its loss creates a sense of threat for the workers. We look at shares and stocks as tools, not necessarily solving all problems, but contributing to the creation of long-range incentives, and we urge their introduction. I feel that every worker of an enterprise should receive ownership stocks in a certain proportion to the firm's investment projects; after all, investments financed from undivided funds reduces earning possibilities in the given year. We hope that, after the new law on associations will be introduced, the increased entrepreneurial opportunities will also contribute to the solution of these problems.

To sum up, we need a system of conditions in which uneconomic, non-competitive products, methods and services will be just about automatically replaced by economic and competitive ones. The state's task in this is primarily to create the environmental (economic, fiscal, marketing and technological) conditions. Until now, this has been less than successful, because our tasks were narrowly interpreted. A recent survey of opinions revealed that, when it comes to technological development, the OMFB is viewed among enterprises as the

most important organ after the government. Thus, our proposals carry a certain weight, and their realization is not a question of good will; good will of course, is still necessary.

Budget Cuts Effect Hungarian Academy S&T Projects

25020014a Budapest MAGYAR HIRLAP in Hungarian 23 Sep 88 p 8

[Istvan Palugyai's interview with Arpad Csurgay, deputy first secretary of the Hungarian Academy of Sciences and other associates of the Academy: "The Academy and Withholdings"]

[Text] The MTI [Hungarian Telegraph Bureau] recently reported that the Hungarian Academy of Sciences will receive less money for its projects than was originally planned. The report, which announced a reduction of 500 million [forints], prompted me to look up Arpad Csurgay, deputy first secretary of the MTA (Hungarian Academy of Sciences], who immediately told me that, unfortunately, the wording of the report could lead to misunderstanding.

Arpad Csurgay: Our budget for the present five-year plan period had built-in lower and upper limits, and the difference between those two figures is exactly 500 million forints. It was this figure of half a billion forints that was now reported as a withholding of some kind. However, as it is reported, it is incorrect: There have been no moneys withheld from the Academy in the recent past.

"What happened was this: Due to inflation, we would have to spend the maximum planned amount in order to complete the projects we have envisioned, when in fact we can at best count on receiving the lowest amount," adds Zsolt Arady, deputy department head for planning and fiscal affairs. "Thus, the Academy's leadership now decided to abandon plans to complete certain projects in this five-year plan period. Included among these projects is the building of a retirement house for scientists which, in any event, was at a standstill because of bureaucratic problems with the lot and the construction permit. Similarly, we can finish building the computer center only after 1990, even though we are starting to work on it. There will be a smaller budget for the modernization of machinery and instrumentation (400 instead of 600 millions), but the institutes will make up some of this central shortfall using their own resources."

"By the way, when it comes to investments, the situation is not as bad as with direct support of research work," adds the deputy first secretary. "For example, on 3 November we will open the new building housing the library of the Academy, which in itself is a project costing 500 million forints. Reconstruction work on the experimental atomic reactor at the KFKI [Central Research Institute of Physics] is also continuing. The comprehensive renovation will cost 460 million forints. In addition, there are a number of smaller investment projects that have been initiated by the institutes themselves. You see, even though the budget has been cut, the Academy's institutes increased their earnings by 47 percent last year. The total income of the 38 institutes amounted to five billion forints in 1987.

MAGYAR HIRLAP: This sounds surprisingly good . . .

Arpad Csurgay: Of course, but the problem is somewhere else: During the 1980s, when material support of research in Western countries has been increasing, in our country it has continuously decreased in real value. In the Austrian budget, for example, operational and investment moneys per researcher increased tenfold during this decade, and as much as 50 percent of all research and development costs were covered by the state. In Hungary, resources per researcher are one-fifth as large, even though a Hungarian researcher needs the same periodicals, needs to attend the same conferences and should use the same data bases. When it comes to the "shopping cart" of scientific research, changes in the price of these items are definitive, and it can be demonstrated that the rate of inflation is higher in research than in consumption or production. Under these conditions, it was particularly devastating that last year the MTA's budget was cut by three percent, and this year by an additional four percent. This means a withholding of nearly 150 million forints; that is, nowhere near the amount mentioned in the MTI report.

MAGYAR HIRLAP: Researchers talk about a shortfall much greater than seven percent . . .

Arpad Csurgay: They are correct: The above mentioned withholdings apply to the entire scale of the Academy's activities and certain items (such as the allocations due to individuals with academic rank) are set by law and cannot be cut. Thus, Academy's leadership was forced to project the withholding (which by then grew to 7.5 percent) on the operating costs of scientific research, which make up about half of the Academy's budget. In this manner, the 7.5 percent cut translated into a 15 percent reduction at the institute level. This was complicated also by inflation. The situation, and the mood, is worst among those researchers who (due to the nature of their work) are unable to augment their earnings by obtaining outside contracts or by other means.

MAGYAR HIRLAP: The Academy convened an extraordinary meeting on 26 September. What was the reason for this, and what was discussed at the meeting?

Arpad Csurgay: Since our previous vice president, F. Bruno Straub, became president of the Presidential Council, and our deputy first secretary, Kalman Kulcsar, was appointed to be Minister of Justice, our basic rules required us to elect new officers in their places. That was one of the points scheduled for the extraordinary meeting. The nominating committee will propose two names for each of the posts. The other topic scheduled for

discussion is the Academy's strategy for fitting into the changes brought on by the rationalization process within the government's work program, which will inevitably have a bearing on the management of scientific work. Preparatory work revealed that the research communities demand a reliable and long-range scientific policy. The extraordinary meeting of the MTA will discuss how it could implement the inner renewal of its own activities and organization, thereby helping to upgrade the effectiveness of Hungarian scientific research, and renew itself in order to better serve the political, economic and cultural development of Hungarian society.

Hungarian Academician Lang on Major Scientific Coalition

25020013b Budapest DELTA IMPULZUS in Hungarian No 9, 1988 p 37

[Text] There still are many possibilities for the in-depth increase and transformation of the cooperation among the Hungarian Academy of Sciences, the universities, and the research institutes which has evolved during the past decades. The potential forms of cooperation, the personnel and material conditions are discussed by Istvan Lang, academician, executive secretary of the MTA [Hungarian Academy of Sciences].

The Hungarian Academy of Sciences currently has 240 domestic members, 172 of whom are actively employed and 68 are retired. Of the actively employed, 86 academicians are working in leading positions at universities, 54 in academic and 14 in sectional research institutes, 5 at enterprises, 11 in party or state administrations and 2 at other places.

Around 3000 experts are active in academic committees. Of these, 43 percent belong to institutions of higher education and 17 percent to academic research institutes.

At present, 63 university departments receive academic support providing employment to 250 scientific investigators and 280 technical personnel. The Academy spends 100 million forints annually for financing scientific research; every year it provides several hundred university faculty with means for trips abroad for scientific purposes. Numerous academic researchers teach at the universities.

In spite of all, the general opinion is that the relationship between the Academy and the universities is inadequate. During the past two years, a rapprochement was begun: the research institutes and university faculties and departments are seeking methods of cooperation based on mutual interests. This process is also advanced by the recognition born of necessity that, in the increasingly difficult budgetary situation, the existing research equipment, establishments and infrastructure must be more effectively exploited. The joint action (Academy and universities) also serves the nationwide protection of scientific research interests which is also very much needed these days.

The universities and the Academy could create a new type of a grand coalition in the sciences. In order to prepare for it, unions should be established between the universities and the Academy, at first between the universities of arts and sciences, the university of economic sciences, and the Academy.

The group of universities of arts and sciences—ELTE [Lorand Eotvos University], JPTE [Janus Pannonius University] JATE [Attila Jozsef University], KLTE [Lajos Kossuth University] MKKE [Karl Marx University of Economic Sciences]—because of its educational profile, in essence its multidisciplinary character—cannot be grouped unequivocally into the "sphere of influence" of any professional discipline. Therefore, it appears necessary that, in the interest of improving the functional conditions of the five universities of arts and sciences listed, of better organization and coordination of the scientific research work and a partial bridging of the significantly constricted financial conditions, a special relationship should be established between the MTA and the "group" of the five universities. It is also motivated by the fact that, of the actively employed members of the Academy, 48 are working in leading positions at these universities.

The new type of cooperation of a decentralized character should be evolved through the realization of the reciprocal advantages. An association of non-legal standing could serve as organizational framework.

Among the themes of cooperation, research would play the dominant role, while, at the same time, close attention would also be paid to the fields of graduate and postgraduate education and training. The association could be named the Research Association of the University and Academy [EAKT]. Other names could also be conceived, of course.

In principle, the association is also open to other universities (or faculties) where significant basic research activities are in progress. The recommended association with the five universities of arts and sciences is the first phase of further, similar steps. At the other universities, the currently existing support from the Academy, prepared for expansion, would remain unchanged.

The operative "guidance" and coordination of the cooperation established within the framework of EAKT can be pictured on two levels:

— The deliberative (scientific management) body of the association would be formed on the basis of parity, with an identical number of members from both parties (the Academy and the universities) and its

chairmanship would be alternated between the general secretary of the MTA and the "highest ranking" among the rectors of the universities.

—The disciplinary councils of the scientific fields most relevant from the aspect of cooperation and association—which would develop and reconcile cooperative programs and plans within the field of the given discipline—the universities involved and the Academy would delegate educators and investigators in leading positions.

In the framework of the EAKT association, the cooperation would be focused on two centers of gravity: research cooperation and research infrastructure.

The goal of the research cooperation is the thematic co-ordination of perspectivistic and selected investigations primarily in the field of basic research; the development and accomplishment of joint research competitions and programs; organization of the more significant research efforts in the framework of state assignments or long-range commissions by enterprises, with special emphasis on the handling of interdisciplinary problems; organization of export ventures from contract research to actions encompassing several links of the innovation chain; and also, by making the entire funding system more effective, further development of the so-called supported academic departmental research activity residing at the universities. The cooperation would extend to the organization of joint events and debate sessions and also to the exchange of investigators and educators.

Regarding the topic of research infrastructure in its broad sense, instrumental cooperation could be brought to the fore: the coordination of instrument purchases, joint purchase of costly instruments, the operation of specialized and regional instrument centers, the organization of instrument services furthering public interest (in this context, the MTA would provide for representation by the universities in the Instrumentation Committee of the MTA); development and use of the information infrastructure in the service of research with special emphasis on a unified network and the provision of access to international data bases; library cooperation with respect to purchases, usage, and the library documentation and information services (in this context, the MTA would provide for representation by the universities in the Library Committee of the MTA); coordination and increased cooperation in the field of scientific book and journal publication; a coordinated operation of the existing copying capacities; development of international contacts associated with research, an increased exploitation of the possibilities for international cooperation in the framework of existing bilateral agreements and those to be developed; importation of research tools and materials relying on the AKADIMPEX organization.

The association requires the consent of the Ministry of Culture and the Presidium of the Academy.

The proposals are being discussed by the leaders of the universities, academic bodies and research institutes and, it is to be hoped, the 1988 general assembly of the MTA will also endorse in principle such type of increased cooperation.

Applications of GDR's EC 1834 PC in Scientific Devices Examined

23020018a East Berlin NACHRICHTENTECHNIK ELEKTRONIK in German No 8, 1988 pp 294-295

[Article by K. Grubba, member of the Chamber of Technology, Berlin, associated with the Center for the Manufacturing of Scientific Devices of the GDR's Academy of Sciences, division of EDP and computer engineering; a paper for the Third Conference on Scientific Device Manufacturing: "Possibilities for Using the EC 1834 With Scientific Devices"]

[Text] The availability of powerful 16-bit personal computers is offering new possibilities for the sector of scientific-device manufacturing [1].

Hitherto, the overall computer-engineering concept of the Center for the Manufacturing of Scientific Devices (ZWG) was based on the use of K1520 subassemblies. To supplement the computer core, consisting of OEM modules of the Robotron Combine, the Center for the Manufacturing of Scientific Devices developed and put into operation about 60 different types of user-specific subassemblies. The number of user-specific subassemblies employed in addition to the computer core varies as a function of the scientific device being used. Not counting one large-scale device, the average has been about 5 types of subassemblies per K1520-using device.

With the personal computer EC 1834, first of all the computer core consisting of OEM modules is being replaced. The problem of user subassemblies and questions of real-time operation have not yet been solved in connection with this. It would be advisable to have a gradual transition to the pure EC 1834 concept through the use of existing hardware solutions. In advance of this, system-theory studies are needed on appropriate equipment offerings in order to arrive at an optimal use of the new technology.

1. Basic Configurations

Table 1 gives five configurations that are coming into use in the ZWG's equipment offerings in connection with the EC 1834. These configurations form a subset of more general arrangements [2] [3].

The configurations designated by numbers 1 and 2 are transitional solutions, because they include K1520 user subassemblies. With numbers 3 and 4 one remains within the EC 1834 system framework, whereas configuration number 5 also allows components external to the system to be connected up through the use of the IEC bus.

Remarks on the configurations based on the numbers in Table 1:1. The coupling in of a subsystem—that is, of K1520 user-specific subassemblies with their own central arithmetic unit—is feasible right now on a hardware basis, via standard computer interfaces.

The coupling software must be meshed in with the operating systems and control programs by taking into account the transmission processes. One disadvantage is a slow data transfer, which usually only permits the processing of already pre-compressed information and control and display functions on the EC 1834.

2. Using the bus coupler considerably accelerates the exchange of data, address, and control signals. The EC 1834 can directly access the K1520 user subassemblies that are closely linked to the relevant process, so that a smooth transition can be made from the K1520 peripheral devices to data collection by the 16-bit processor.

3. The available plug-in locations within the EC 1834 will remain limited to 1 to 3, depending on the peripheral equipment. Even under the assumption that through the increasing degree of integration of modern circuits higher densities of component parts can be achieved than with the K1520, nevertheless in the case of a strict circuit substitution only about half of the device computers will be workable with add-in user subassemblies (see here also Figure 1 [not reproduced in translation]; K1520 and EC 1834 printed circuit boards are roughly equal in area).

4. Along with number 3, this configuration is likewise definitive. Devices having extensive peripheral equipment for the relevant process have a need for this configuration.

5. The IEC bus is the international standard for the field of mensuration engineering and laboratory automation.

The following generalizations can also be derived from Table 1.

For the range of applications of ZWG's it is necessary to supplement by the following components the EC 1834 standard subassemblies provided for computer operation:

- K1520 bus coupler
- EC 1834 bus expander
- IEC adapter.

These subassemblies are also important for other users outside the field of the manufacturing of scientific devices.

An accessory receptacle must be a part of the standard product mix for the EC 1834.

lfd.Nr	Konfiguration	Bemerkungen
1	K1520-Subsystem — IFSS; V.24 — EC 1834	
2	K 1520 Baugruppen — K1520-Bus — 1 EC 1834	1 Buskoppler
3	1 2 EC 1834	1,2 add-in-Anwender-Baugruppen
4	1 EC 1834-Baugruppen — EC 1834-Bus — 2 EC 1834	2 Beistellgefäß mit add-on-Baugruppen 2 Busexpander
5	Subsystem mit IEC-Anschluß — IEC-Bus — 1 EC 1834	1 IEC-Bus-Adapter

Table 1. Basic Configurations

Key:
1. Number
2. Configuration
3. Remarks
4. Subassemblies
5. 1—bus coupler
6. 1, 2—add-in user subassemblies
7. 2 [sic]—accessory receptacle with add-on subassemblies; 2—bus expander
8. Subsystem with IEC connection

2. Initial User Solutions Made by the ZWG

Currently, configurations 2, 3, and 4 are being taken as the basis for using the EC 1834 in the device production offerings of the ZWG. The communication connections that are important for information flow are outlined in Figure 2. The corresponding interfaces can be seen in Table 1.

The following EC 1834 user-specific subassemblies are being developed:

- K1520-EC 1834 bus coupler
- Rapid measured-value input with DMA access
- ADU [analog-digital converter] 12-bit/40 µs with data acquisition processor U 8000.

As an aid to the development work, an all-purpose printed circuit board has been designed.

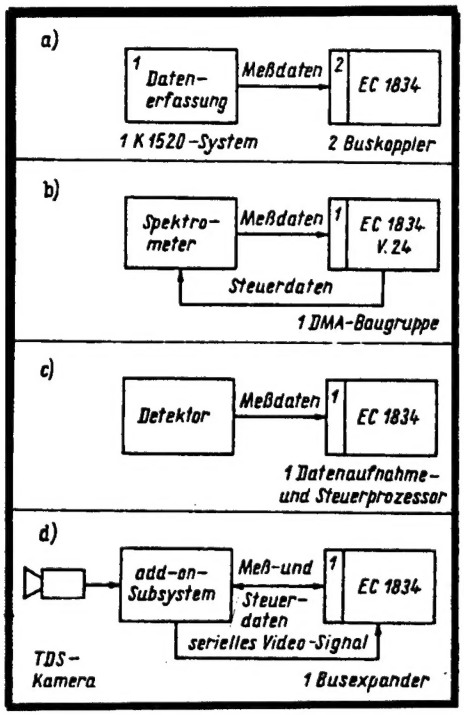

Figure 2. Outline Structure of Solutions Made by the ZWG; a) Multichannel Magnetometer; b) Energy-dispersion X-ray Spectrometer; c) Spectrophotometric Detector; d) Streak Measuring Device

Key:
1. Data collection
2. Measurement data
3. 1—K1520 system
4. 2—bus coupler
5. Spectrometer
6. Control data
7. 1—DMA subassembly
8. Detector
9. 1—data acquisition and control processor
10. TDS camera
11. Measurement and control data
12. Serial video signal
13. 1—bus expander

As part of a study it is being investigated whether a special color graphics controller will be required for the displaying of measured-value graphs and picture frames, and what software is useful to that end.

In general the developed user software will be closely linked to the type of associated device, especially when real-time tasks are involved. The preferred programming language is Turbo Pascal. There is not as yet any determination on a real-time operating system.

For data analysis and display the aim is to incorporate time-tested user software of the computer manufacturer.

3. Concluding Observation

The adherence on the part of the EC 1834 to the PC/XT industrial standard ensures international compatibility. This facilitates the exchanging of hardware and software components to a degree similar to what was already the case with the CAMAC system.

Bibliography

[1] Grubba, K.; Rudolph, A.: "Use of Personal Computers With Scientific Devices," Eighth Scientific Conference of the Mittweida IH, 1987, conference documents, session group C, pp 36-46.

[2] Mennenga, H.; Luebcke, I.: "Utilization of Personal Computers for Process Recording and Control," study, Warnemuende/Wustrow IH for Sea Navigation, 1987.

[3] Peters, D.; Leege, K. W.: Tasking Workbook [Pflichtenheft] for Laboratory Automation System LAS 700, Rossendorf Central Institute for Nuclear Research, 1987.

TELECOMMUNICATIONS R&D

Satellite Television To Go On-Line in 1990

23020035 East Berlin RADIO FERNSEHEN ELEKTRONIK in German No 11, 1988 p 683

[Text] In the 1990's, pursuant to an agreement with the International Telecommunications Union (ITU), the CSSR plans to begin transmitting television programs via satellite. In this way, it will participate in the elaboration of the fundamental system approaches and technical principles for satellite transmission systems within the framework of the complex program for the scientific and technical progress of the CEMA member countries through the year 2000. The Soviet Union will provide most of the equipment for geostationary satellites.

The CSSR is conducting research in wave propagation for satellite television [signal] transmission; it also is working on the development of different types of ground stations for satellite television and is testing two cable network configurations in residential areas. By the early 1990's, there should be 80 ground stations to receive the signals from space and relay them in the conventional manner.

The next stage in the development of satellite television is to begin around the year 2000, with the transmission of television programs over four or five channels. At present, the CSSR has two television channels. One channel can be picked up in around 95 percent of the country's territory, where over 98 percent of the CSSR's citizens live; the other channel is picked up by 75 percent of the CSSR's citizens.

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